

Report to  
**THE INTERNATIONAL JOINT COMMISSION**

on

**THE DIVISION OF THE WATERS OF THE  
ST. MARY AND MILK RIVERS**

1981

by

**Phillp Cohen**  
representing United States

and

**D.A. Davis**  
representing Canada

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1981

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CALGARY DISTRICT OFFICE

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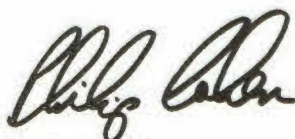
March 1982

International Joint Commission  
Ottawa, Ontario and Washington, D.C.

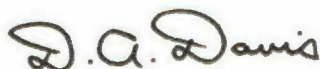
Gentlemen:

In compliance with the provisions of Clause VIII (c) of your order of October 4, 1921, directing the division of the waters of St. Mary and Milk Rivers between the United States and Canada, we are transmitting herewith a report on the operations during the irrigation season ended October 31, 1981.

Respectfully submitted,

A handwritten signature in dark ink, appearing to read "Philip Cohen". The signature is fluid and cursive, with the first name "Philip" written in a larger, more prominent script than the last name "Cohen".

Philip Cohen  
Accredited Officer of the United States

A handwritten signature in dark ink, appearing to read "D.A. Davis". The signature is written in a cursive style, with the initials "D.A." clearly visible at the beginning, followed by the surname "Davis".

D.A. Davis  
Accredited Officer of Her Majesty

## SYNOPSIS

During the 1981 irrigation season the natural flow of the St. Mary and Milk Rivers was 93 percent and 77 percent, respectively, of the average long-term natural flows.

The natural flow of the St. Mary River during the irrigation season, April 1 to October 31, 1981, was 675 000 cubic decametres (dam<sup>3</sup>) (547,000 acre-feet). Under the terms of the Treaty the Canadian share was 404 000 dam<sup>3</sup> (328,000 acre-feet). The total runoff recorded at the International Boundary during the irrigation season was 107 percent of the Canadian allotment.

The natural flow of the Milk River at its eastern crossing of the International Boundary was 113 000 dam<sup>3</sup> (91,600 acre-feet) with no adjustments for upstream usage by Canada and the United States from March 1 to October 31, 1981. Under the terms of the Treaty the United States' allotment was 79 200 dam<sup>3</sup> (64,200 acre-feet). An accurate determination of natural flow and apportionment of the flow of the Milk River has historically not been made as it is assumed that United States and Canadian use is less than their respective shares.

However, increasing use in both countries and the potential for constructing a major storage reservoir in Canada have resulted in a joint study to derive methods for accurately determining detailed computations of natural flow at the eastern crossing of the International Boundary. A report on the accomplishments of the study will be prepared by October 1982 and will be made available to the International Joint Commission after review by the Accredited Officers.

The natural flow of the three eastern tributaries of the Milk River that are apportioned, Lodge Creek, Battle Creek, and Frenchman River, was 3.4 percent,

27 percent, and 21 percent, respectively, of the average long-term natural flow. The combined natural flow of these tributaries was 28 300 dam<sup>3</sup> (22,900 acre-feet), of which the United States received 14 300 dam<sup>3</sup> (11,600 acre-feet). A deficit delivery of 223 dam<sup>3</sup> (181 acre-feet) occurred on Lodge Creek during the irrigation season. This deficit was the result of delaying releases from storage to make up the deficit until late in the year when channel losses were large. Of the 616 dam<sup>3</sup> (499 acre-feet) released, only 70 dam<sup>3</sup> (57 acre-feet) reached the International Boundary. Additional releases were not possible owing to the small amount of water remaining in storage. A deficit delivery of 767 dam<sup>3</sup> (622 acre-feet) occurred on the Frenchman River during the irrigation season. This deficit was the result of underestimating the minor diversions in the interim natural-flow calculations. In dry years the present methodology tends to underestimate the minor diversions, which in 1981 accounted for 17 percent of the natural flow. Efforts will be made to receive interim minor diversion reports or develop a more appropriate methodology for very dry years.

The combined usable storage of the six major Canadian reservoirs on the Eastern Tributaries declined to 3 percent of the total usable storage by October 31, 1981. A well-above-average runoff in 1982 will be required to meet the potential demands in both countries.



## TABLE OF CONTENTS

|                                       | <u>PAGE</u> |
|---------------------------------------|-------------|
| SYNOPSIS                              | i           |
| TABLE OF CONTENTS                     | iii         |
| INTRODUCTION                          | 1           |
| ST. MARY RIVER                        | 2           |
| MILK RIVER                            | 7           |
| EASTERN TRIBUTARIES OF THE MILK RIVER | 9           |
| LODGE CREEK                           | 12          |
| BATTLE CREEK                          | 15          |
| FRENCHMAN RIVER                       | 18          |

## TABLES

|  |       |
|--|-------|
| 1 Summary of Division of St. Mary River<br>and Diversion to Milk River | 5-6   |
| 2 Summary of Lodge Creek Division                                      | 13-14 |
| 3 Summary of Battle Creek Division                                     | 16-17 |
| 4 Summary of Frenchman River Division                                  | 19-20 |

## ANNEX

|   |    |
|---|----|
| A Treaty between the United States and Great Britain<br>relating to Boundary Waters; and Questions Arising<br>between the United States and Canada - Article VI | 21 |
| International Joint Commission - 1921 Order   |    |
| B International System of Units<br>(SI) Conversions   | 26 |
| C List of Gauging Stations  | 28 |

## MAP

|  |    |
|--|----|
| Map of St. Mary and Milk River Drainage Basins | 34 |
|--|----|

## INTRODUCTION

Article VI of the Boundary Waters Treaty of 1909 between Great Britain and the United States governs the apportionment of the waters of the St. Mary and Milk Rivers. The terms of the Treaty were further clarified by the 1921 Order of the International Joint Commission. Copies of Article VI and the 1921 Order are contained in Annex A of this report. To comply with this Treaty, field representatives of the United States and Canada collected and compiled, on a cooperative basis, hydrometric data at 39 international gauging stations.

An additional 39 gauging stations were operated independently by Canada or the United States to obtain data on diversions, reservoir contents, return flows, and index runoff. Most of this additional information is used to improve the accuracy of natural-flow computations.

This report summarizes the natural-flow computations during 1981, comments on the apportionment of the natural flow, and explains any unusual occurrences throughout the year as well as any modifications that have been or are being contemplated for increasing the accuracy of the natural-flow computations. Summary natural-flow tables are included in the report proper, whereas the detailed natural-flow computations are included in Appendix A. The daily discharge and other related data for 1981 are included in Appendix B. Appendices A and B are submitted with this report under separate cover.

In accordance with the SI conversion schedule established by the International Joint Commission, this report uses SI units first, followed by Imperial units in parentheses. Data in tables are shown in SI units first, followed by the respective Imperial unit table, for example Tables 1 and 1A.

The format for Appendices A and B of the report are SI units only. All Canadian data are published in SI units. Data collected and compiled by the United States were computed in Imperial units and converted to SI units using the appropriate conversions. A summary of the conversion factors is contained in Annex B.

Mr. Philip Cohen, Chief Hydrologist, United States Geological Survey, as Accredited Officer of the United States, was represented in the field by Mr. G. M. Pike, District Chief, United States Geological Survey, Helena, Montana. Mr. D. A. Davis, Regional Director, Western & Northern Region, Inland Waters Directorate, as Accredited Officer of Her Majesty, was represented in the field by Mr. G. H. Morton, Regional Chief, Water Survey of Canada, Calgary, Alberta and Mr. R. A. Halliday, Regional Chief, Water Survey of Canada, Regina, Saskatchewan. This report was prepared jointly by personnel of the United States Geological Survey and the Water Survey of Canada under the supervision of Messrs. Pike, Morton, and Halliday.

The annual conference between the staffs of the field representatives was held in Helena, Montana on February 2, 1982. Streamflow records collected jointly by Canada and the United States were reviewed and approved. Mutual problems and changes in computational procedures were discussed and a schedule of field operations for 1982 adopted.

#### ST. MARY RIVER

During the irrigation season, April 1 to October 31, Canada's share of the natural flow of the St. Mary River at the International Boundary is, as stipulated by the 1921 Order, to be three-fourths of the natural flow when that flow is 666 cubic feet per second (18.86 cubic meters per second) or less, with any excess flow being divided equally between Canada and United States.



During the non-irrigation season, November 1 to March 31, the flow is to be divided equally between the two countries.

To comply with the above order, representatives of both countries make semi-monthly computations of the daily natural flow of the St. Mary River during the irrigation season. If usage by the United States is in excess of its share, then at the earliest opportunity a delivery of an equivalent amount of water is made to Canada. Regular interim reports of these computations are sent to all agencies involved in the water use and management of the flow of the St. Mary River. The interim reports keep these agencies informed as to the amount of water available.

Tentative computations and interim reports are not made during the non-irrigation season, because the only usage by the United States during this period is storage in Lake Sherburne. The storage in Lake Sherburne is considerably less than 50 percent of the natural flow.

Lake Sherburne, the only storage reservoir within the St. Mary River basin in the United States, is used to store a portion of the United States' share of flows for diversion to the Milk River. This water, which passes through Canada, is used by the United States for irrigation in the lower Milk River valley.

Storage in Lake Sherburne was 16 200 dam<sup>3</sup> (13,100 acre-feet) on October 31, 1980, and had increased to 21 200 dam<sup>3</sup> (17,200 acre-feet) just prior to the irrigation season on March 31, 1981. Maximum storage was 84 400 dam<sup>3</sup> (68,400 acre-feet) on July 7 and storage decreased to 9 300 dam<sup>3</sup> (7,540 acre-feet) by the end of the irrigation season on October 31, 1981.

Water was diverted from the St. Mary River into the St. Mary Canal leading to the Milk River from March 2 to September 30, 1981. The total recorded flow for the gauging station on the St. Mary Canal at St. Mary Crossing (station 05AE029) was 286 000 dam<sup>3</sup> (232,000 acre-feet). Any seepage from the canal between the point of diversion and the crossing of the St. Mary River is assumed to return to the river and eventually become available to Canada.

The total natural flow of the St. Mary River at the International Boundary from November 1, 1980, to October 31, 1981, was 778 000 dam<sup>3</sup> (631,000 acre-feet), of which 675 000 dam<sup>3</sup> (547,000 acre-feet) occurred during the irrigation season, April 1 to October 31, 1981. For the irrigation season, Canada's and the United States' shares were 404 000 dam<sup>3</sup> (328,000 acre-feet) and 271 000 dam<sup>3</sup> (220,000 acre-feet), respectively. A total discharge of 431 000 dam<sup>3</sup> (349,000 acre-feet) was recorded at the International Boundary, which was 107 percent of the Canadian share. The computed natural flow during the irrigation season was 93 percent of the average of the previous 79 years of record.

Deficit deliveries were recorded in 4 of the 14 division periods during the 1981 irrigation season. The deficit which occurred during the May 1 to 15 division period, was refunded during the period immediately following, while the deficit which occurred during the April 1 to 15 division period was not completely refunded until the May 16 to 31 division period. Small deficits that occurred during the August 1 to 15 and August 16 to 31 division periods were refunded during the September 1 to 15 division period.

Tables 1 and 1A, which follow, summarize the apportionment of the waters of the St. Mary River.

**TABLE 1**  
**SUMMARY OF DIVISION OF ST. MARY RIVER AND DIVERSION TO MILK RIVER**  
**1981**  
 QUANTITIES IN CUBIC DECAMETRES

| MONTH                         | St. MARY RIVER<br>AT<br>INTERNATIONAL BOUNDARY |                 |                |                   | EXCESS<br>REC'D<br>BY<br>CANADA | STORAGE<br>LAKE<br>SHERBURNE | TOTAL<br>AVAILABLE<br>FOR<br>DIVERSION | St. MARY<br>CANAL<br>AT<br>St. MARY<br>CROSSING | MILK *<br>RIVER<br>AT<br>EASTERN<br>CROSSING |
|-------------------------------|--|-----------------|----------------|-------------------|---------------------------------|------------------------------|--|---|--|
|                               | RECORDED<br>FLOW                               | NATURAL<br>FLOW | U. S.<br>SHARE | CANADA'S<br>SHARE |                                 |                              |  |   |  |
| APR.                          | 27 512   | 40 364          | 12 659         | 27 705            | -193                            | -12 898                      | 25 557                                 | 25 750  | 39 155                                       |
| MAY                           | 137 364  | 222 198         | 98 454         | 123 744           | 13 620                          | 42 786                       | 55 667                                 | 42 047  | 79 740                                       |
| JUN.                          | 112 470  | 192 905         | 84 214         | 108 690           | 3 780                           | 32 300                       | 51 914                                 | 48 134  | 70 526                                       |
| JUL.                          | 82 507   | 127 372         | 51 043         | 76 329            | 6 178                           | -6 124                       | 57 168                                 | 50 990  | 56 810                                       |
| AUG.                          | 37 276   | 52 000          | 14 362         | 37 638            | -362                            | -32 608                      | 46 970                                 | 47 332  | 45 690                                       |
| SEP.                          | 20 441   | 23 184          | 5 798          | 17 386            | 3 056                           | -37 822                      | 43 621                                 | 40 565  | 42 356                                       |
| OCT.                          | 13 319   | 16 647          | 4 164          | 12 483            | 837                             | 3 328                        | 837                                    | 0   | 9 302  |
| TOTAL<br>IRRIGATION<br>SEASON | 430 889  | 674 670         | 270 694        | 403 975           | 26 916                          | -11 038                      | 281 734                                | 254 818   | 343 579                                      |

\* Milk River at Eastern Crossing is the Natural flow of the Milk River plus the diversion from the St. Mary River basin, less unaccounted canal losses.

QUANTITIES FOR ST. MARY RIVER DIVISION PERIODS IN CUBIC DECAMETRES

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | CANADA'S<br>SHARE | RECEIVED<br>BY<br>CANADA | RECEIVED BY CANADA |             |
|---|-----------------|-------------------|--------------------------|--------------------|-------------|
|   |                 |                   |                          | ABOVE SHARE        | BELOW SHARE |
| APR. 1 TO APR. 15                               | 10 462          | 7 849             | 6 858                    |                    | 991         |
| APR. 16 TO APR. 30                              | 29 902          | 19 857            | 20 654                   | 798                |             |
| MAY 1 TO MAY 15                                 | 66 545          | 39 390            | 37 323                   |                    | 2 067       |
| MAY 16 TO MAY 31                                | 155 653         | 84 354            | 100 041                  | 15 688             |             |
| JUN. 1 TO JUN. 15                               | 109 265         | 60 754            | 63 294                   | 2 540              |             |
| JUN. 16 TO JUN. 30                              | 83 639          | 47 936            | 49 177                   | 1 240              |             |
| JUL. 1 TO JUL. 15                               | 75 456          | 43 843            | 49 876                   | 6 033              |             |
| JUL. 16 TO JUL. 31                              | 51 917          | 32 486            | 32 630                   | 144                |             |
| AUG. 1 TO AUG. 15                               | 29 614          | 20 926            | 20 679                   |                    | 247         |
| AUG. 16 TO AUG. 31                              | 22 386          | 16 713            | 16 598                   |                    | 115         |
| SEP. 1 TO SEP. 15                               | 13 992          | 10 491            | 11 262                   | 771                |             |
| SEP. 16 TO SEP. 30                              | 9 192           | 6 895             | 9 180                    | 2 285              |             |
| OCT. 1 TO OCT. 15                               | 9 857           | 7 396             | 8 201                    | 805                |             |
| OCT. 16 TO OCT. 31                              | 6 789           | 5 086             | 5 118                    | 32                 |             |



**TABLE 1A**  
**SUMMARY OF DIVISION OF ST. MARY RIVER AND DIVERSION TO MILK RIVER**  
**1981**

QUANTITIES IN ACRE-FEET

| MONTH                         | ST. MARY RIVER<br>AT<br>INTERNATIONAL BOUNDARY |                 |               |                   | EXCESS<br>REC'D<br>BY<br>CANADA | STORAGE<br>LAKE<br>SHERBURNE | TOTAL<br>AVAILABLE<br>FOR<br>DIVERSION | ST. MARY<br>CANAL<br>AT<br>ST. MARY<br>CROSSING | MILK *<br>RIVER<br>AT<br>EASTERN<br>CROSSING |
|-------------------------------|--|-----------------|---------------|-------------------|---------------------------------|------------------------------|--|---|--|
|                               | RECORDED<br>FLOW                               | NATURAL<br>FLOW | U.S.<br>SHARE | CANADA'S<br>SHARE |                                 |                              |  |   |  |
| APR.                          | 22,304   | 32,724          | 10,263        | 22,461            | -157                            | -10,457                      | 20,719                                 | 20,876  | 31,744                                       |
| MAY                           | 111,364  | 180,139         | 79,818        | 100,321           | 11,042                          | 34,688                       | 45,130                                 | 34,088  | 64,646                                       |
| JUN.                          | 91,181   | 156,391         | 68,274        | 88,117            | 3,065                           | 26,186                       | 42,088                                 | 39,023  | 57,176                                       |
| JUL.                          | 66,890   | 103,263         | 41,382        | 61,881            | 5,008                           | -4,964                       | 46,346                                 | 41,338  | 46,057                                       |
| AUG.                          | 30,221   | 42,157          | 11,643        | 30,514            | -294                            | -26,436                      | 38,079                                 | 38,373  | 37,042                                       |
| SEP.                          | 16,572   | 18,796          | 4,701         | 14,095            | 2,477                           | -30,663                      | 35,363                                 | 32,886  | 34,338                                       |
| OCT.                          | 10,798   | 13,496          | 3,376         | 10,120            | 678                             | 2,698                        | 678                                    | 0   | 7,541  |
| TOTAL<br>IRRIGATION<br>SEASON | 349,330  | 546,966         | 219,457       | 327,509           | 21,819                          | -8,948                       | 228,403                                | 206,584   | 278,544                                      |

\* Milk River at Eastern Crossing is the Natural flow of the Milk River plus the diversion from the St. Mary River basin, less unaccounted canal losses.

QUANTITIES FOR ST. MARY RIVER DIVISION PERIODS IN ACRE-FEET

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | CANADA'S<br>SHARE | RECEIVED<br>BY<br>CANADA | RECEIVED BY CANADA |             |
|---|-----------------|-------------------|--------------------------|--------------------|-------------|
|   |                 |                   |                          | ABOVE SHARE        | BELOW SHARE |
| APR. 1 TO APR. 15                               | 8,481           | 6,363             | 5,560                    |                    | 803         |
| APR. 16 TO APR. 30                              | 24,242          | 16,098            | 16,745                   | 647                |             |
| MAY 1 TO MAY 15                                 | 53,949          | 31,934            | 30,258                   |                    | 1,676       |
| MAY 16 TO MAY 31                                | 126,190         | 68,387            | 81,105                   | 12,718             |             |
| JUN. 1 TO JUN. 15                               | 88,583          | 49,254            | 51,313                   | 2,059              |             |
| JUN. 16 TO JUN. 30                              | 67,808          | 38,863            | 39,868                   | 1,006              |             |
| JUL. 1 TO JUL. 15                               | 61,173          | 35,544            | 40,436                   | 4,891              |             |
| JUL. 16 TO JUL. 31                              | 42,090          | 26,337            | 26,454                   | 117                |             |
| AUG. 1 TO AUG. 15                               | 24,008          | 16,965            | 16,765                   |                    | 200         |
| AUG. 16 TO AUG. 31                              | 18,149          | 13,549            | 13,456                   |                    | 93          |
| SEP. 1 TO SEP. 15                               | 11,344          | 8,505             | 9,130                    | 625                |             |
| SEP. 16 TO SEP. 30                              | 7,452           | 5,590             | 7,442                    | 1,853              |             |
| OCT. 1 TO OCT. 15                               | 7,992           | 5,996             | 6,649                    | 653                |             |
| OCT. 16 TO OCT. 31                              | 5,504           | 4,124             | 4,149                    | 26                 |             |

### MILK RIVER

During the irrigation season, April 1 to October 31, the United States' share of the natural flow of the Milk River at Eastern Crossing of the International Boundary is, as stipulated by the 1921 Order, to be three-fourths of the natural flow when that flow is 666 cubic feet per second (18.86 cubic meters per second) or less, with any excess flow being divided equally between the United States and Canada. During the non-irrigation season, November 1 to March 31, the flow is to be divided equally between the countries.

To comply with the above order, representatives of both countries make monthly computations of the natural flow of the Milk River during the irrigation season. This computation includes adjustment for the water diverted from the St. Mary River basin and evapotranspiration losses but does not include a computation of water used by Canada or the United States within the Milk River basin itself. Historically it has been assumed that Canadian and United States use is less than their respective shares and no formal apportionment has been made. However, several consecutive dry years and the increasing use of sprinkler-irrigation systems have resulted in increased use by Canadian and United States irrigators. To evaluate the significance of the increased use, a joint, natural-flow study is being conducted by Canada and the United States. In addition, the potential construction of a major storage reservoir on the Milk River in Canada will necessitate the establishment of a more comprehensive water-division procedure.



In support of a natural flow study, gauging stations were constructed at Milk River near Pendant d'Oreille (station 11AA035) and at Milk River near Writing-on-Stone Park (station 11AA034). These stations have been operated during the irrigation season since 1978. In August of 1980 a number of miscellaneous measurements were made on the Milk River between Writing-on-Stone Park and Eastern Crossing of the International Boundary. During the 1981 field season, this measurement program was expanded to include the entire reach in Canada. Preliminary analysis of the measurement data indicated neither a gain nor a loss trend.

In addition, ground-water movement and evapotranspiration studies were started to help determine the effects of these parameters on surface flow. A number of ground-water wells were drilled in late 1981 to ascertain potential for seepage losses and to provide data for an evapotranspiration-loss study. Also, to provide information for use in the evapotranspiration study, a water-level station was installed in late 1981 on the Milk River at 880 Bridge, located slightly upstream from Breed Creek. These studies are being conducted in preparation for a more formal and precise natural-flow computation procedure. Canada is now considering the construction of a 124 000 dam<sup>3</sup> (100,000 acre-feet) reservoir on the main stem of the Milk River in Canada to allow better utilization of its share of the Milk River.

The natural flow of the Milk River at Eastern Crossing of the International Boundary from March 1 to October 31, 1981, was 113 000 dam<sup>3</sup> (91,600 acre-feet). This is 77 percent of the average natural flow of the previous 69 years of record. The respective shares of the United States and Canada were 79 200 dam<sup>3</sup> (64,200 acre-feet) and 34 200 dam<sup>3</sup> (27,700 acre-feet) during the irrigation

season. The computations for determining the natural flow of the Milk River at its eastern crossing are given in Table 8 in Appendix A.

The total recorded flow at Milk River at Eastern Crossing of the International Boundary from March 1 to October 31, 1981, was 380 000 dam<sup>3</sup> (308,000 acre-feet). The recorded flow is composed of the natural flow of the Milk River, plus diverted St. Mary River water, which is used by downstream Milk River users in the United States.

#### EASTERN TRIBUTARIES OF THE MILK RIVER

The waters of the eastern tributaries of the Milk River are divided in accordance with the Order of the International Joint Commission dated October 4, 1921, which stipulates under Rule III that "The natural flow of the eastern (otherwise known as the Saskatchewan or northern) tributaries of the Milk River at the points where they cross the International Boundary shall be divided equally between the two countries." This order might well be interpreted as requiring that the division of water be made on a continuing basis. However, the physical limitation due to transit time in the flow system was recognized. Further analyses showed that the minimum practical time frame for compilation of the natural flows at the International Boundary was a 10-day period.

Prior to 1937, Canadian usage on the eastern tributaries consisted of private irrigators, and the Canadian share of the natural flow was not fully used. The construction of Eastend Reservoir (station 11AC055), Huff Lake (station 11AC063), and Newton Lake (station 11AC056) by the Government of Canada on the Frenchman River during the late 1930's made an operational division of flow necessary on this tributary by 1937.

The redevelopment of several private irrigation projects and the construction of the Vidora Irrigation Project during the early 1950's resulted in increased usage of Battle Creek water in Canada and made an operational division of flow on this tributary necessary by 1957.

Construction of Altawan Reservoir (station 11AB089) and Spangler Irrigation Project on Lodge Creek in 1960 made an operational division of flow on this tributary necessary by 1961.

During the runoff season, March 1 to October 31, 10-day computations of the natural flows of Lodge Creek, Battle Creek and Frenchman River are made to determine each country's share. If usage by Canada is in excess of its share, then at the earliest opportunity a delivery of an equivalent amount of water is made to the United States. During some years the United States may request that delivery of deficit water on Battle Creek be delayed to allow better utilization by United States irrigators. Canada may honor this request if no regulation problems are anticipated by delaying the delivery of water to make up the deficit. Regular interim reports on the progress of the division of the natural flows of Lodge Creek, Battle Creek and Frenchman River at the International Boundary were made to interested agencies throughout the runoff season. No division of flow is made during the winter as flow and use generally are small and streamflow records are impractical to obtain.

Lyons Creek is monitored but does not have sufficient usage in Canada at this time to warrant an operational division of flow. No flow was recorded on this tributary from March 1 to October 31, 1981.



During 1981 only one change was made to the network of stations in the eastern tributaries. Val Marie Pump No. 2 was discontinued as a station and is now considered to be a minor diversion.

Estimates of unmeasured diversions to private irrigation projects in the Lodge Creek, Battle Creek, and Frenchman River basins in Saskatchewan were provided by Saskatchewan Environment, and for the Lodge Creek basin in Alberta by the Regina office of the Water Resources Branch of Environment Canada. These estimates are based on reports received from the operators of individual projects and by onsite inspections. An additional charge is made for domestic projects in the Battle Creek and Frenchman River basins based on the results of studies conducted by Canada on domestic-project use.

For the interim reports prepared at the end of apportionment periods, an estimate of minor diversion-projects use is made based on a correlation between annual natural flows and reported use for previous years. The total natural flow for the current year is derived from computed natural flow to date plus an estimate of runoff volume for the rest of the year dependent on runoff conditions. At the end of the year, the actual flow is known and a final estimate of minor diversions is made based on reported use; consequently, some discrepancy exists between interim and final division computations. Lists of reported and estimated diversions for 1981 are contained in Appendix B.

The combined usable storage of the six major Canadian reservoirs decreased from 33 080 dam<sup>3</sup> (26,800 acre-feet), or 24 percent, to 4 200 dam<sup>3</sup> ( 3,400 acre-feet), or 3 percent, of the total usable storage from March 1 to October 31, 1981.

## LODGE CREEK

The computed natural flow of Lodge Creek below McRae Creek at the International Boundary (station 11AB083) from March 1 to October 31, 1981, was 1260 dam<sup>3</sup> (1,020 acre-feet) or 3.4 percent of the average natural flow of the previous 31 years of record. Each country is entitled to 50 percent of the natural flow. A total flow of 407 dam<sup>3</sup> (330 acre-feet) was recorded at the International Boundary and represents the least flow on record.

Deficit deliveries were recorded in 9 of the 24 division periods during the season. The irrigation season deficit of 224 dam<sup>3</sup> (182 acre-feet) was primarily the result of not refunding deficit deliveries early in the season when channel losses were minimal. A release of 616 dam<sup>3</sup> (499 acre-feet) was made from Altawan Reservoir in late July to attempt to refund the deficit, but due to significant channel losses, only 70 dam<sup>3</sup> (57 acre-feet) reached the International Boundary. No additional stored water was available for release owing to the low levels of storage reservoirs.

No return flow was recorded at Squaw Coulee near Willow Creek (station 11AB103) from the 1390 dam<sup>3</sup> (1,130 acre-feet) diverted by Spangler Ditch from Lodge Creek.

The division of the Lodge Creek natural flow is summarized in Tables 2 and 2A. The detailed computation of the natural flow is given in Table 9 and the historical summary in Table 10 of Appendix A.



**TABLE 2**  
**SUMMARY OF LODGE CREEK DIVISION**  
**1981**

QUANTITIES IN CUBIC DECAMETRES

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | U.S.A.<br>SHARE | RECEIVED<br>BY<br>U.S.A. | RECEIVED BY U.S.A. |             |
|---|-----------------|-----------------|--------------------------|--------------------|-------------|
|   |                 |                 |                          | ABOVE SHARE        | BELOW SHARE |
| MAR. 1 - MAR. 10                                | 290             | 145             | 31                       |                    | 114         |
| MAR. 11 - MAR. 20                               | 77              | 39              | 27                       |                    | 12          |
| MAR. 21 - MAR. 31                               | 0               | 0               | 7                        | 7                  |             |
| APR. 1 - APR. 10                                | 0               | 0               | 8                        | 8                  |             |
| APR. 11 - APR. 20                               | 2               | 1               | 2                        | 1                  |             |
| APR. 21 - APR. 30                               | 17              | 9               | 0                        |                    | 9           |
| MAY 1 - MAY 10                                  | 24              | 12              | 0                        |                    | 12          |
| MAY 11 - MAY 20                                 | 297             | 149             | 0                        |                    | 149         |
| MAY 21 - MAY 31                                 | 150             | 75              | 142                      | 67                 |             |
| JUN. 1 - JUN. 10                                | 122             | 61              | 115                      | 54                 |             |
| JUN. 11 - JUN. 20                               | 179             | 90              | 5                        |                    | 85          |
| JUN. 21 - JUN. 30                               | 31              | 16              | 0                        |                    | 16          |
| JUL. 1 - JUL. 10                                | 61              | 31              | 0                        |                    | 31          |
| JUL. 11 - JUL. 20                               | 0               | 0               | 0                        | 0                  |             |
| JUL. 21 - JUL. 30                               | 0               | 0               | 68                       | 68                 |             |
| AUG. 1 - AUG. 10                                | 6               | 3               | 2                        |                    | 1           |
| AUG. 11 - AUG. 20                               | 0*              | 0*              | 0                        | 0*                 |             |
| AUG. 21 - AUG. 31                               | 0*              | 0*              | 0                        | 0*                 |             |
| SEP. 1 - SEP. 10                                | 0*              | 0*              | 0                        | 0*                 |             |
| SEP. 11 - SEP. 20                               | 0*              | 0*              | 0                        | 0*                 |             |
| SEP. 21 - SEP. 30                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 1 - OCT. 10                                | 0*              | 0*              | 0                        | 0*                 |             |
| OCT. 11 - OCT. 20                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 21 - OCT. 31                               | 0               | 0               | 0                        | 0                  |             |

TOTAL - cubic decametres

1256

631

407

\*Middle Creek Reservoir adjustment based on inflow-outflow records.

**TABLE 2A**  
**SUMMARY OF LODGE CREEK DIVISION**  
**1981**

QUANTITIES IN CFS-DAYS

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | U.S.A.<br>SHARE | RECEIVED<br>BY<br>U.S.A. | RECEIVED BY U.S.A. |             |
|---|-----------------|-----------------|--------------------------|--------------------|-------------|
|   |                 |                 |                          | ABOVE SHARE        | BELOW SHARE |
| MAR. 1 - MAR. 10                                | 119             | 59              | 13                       |                    | 46          |
| MAR. 11 - MAR. 20                               | 31              | 16              | 11                       |                    | 5           |
| MAR. 21 - MAR. 31                               | 0               | 0               | 3                        | 3                  |             |
| APR. 1 - APR. 10                                | 0               | 0               | 3                        | 3                  |             |
| APR. 11 - APR. 20                               | 1               | 0               | 1                        | 0                  |             |
| APR. 21 - APR. 30                               | 7               | 4               | 0                        |                    | 4           |
| MAY 1 - MAY 10                                  | 10              | 5               | 0                        |                    | 5           |
| MAY 11 - MAY 20                                 | 121             | 61              | 0                        |                    | 61          |
| MAY 21 - MAY 31                                 | 61              | 31              | 58                       | 27                 |             |
| JUN. 1 - JUN. 10                                | 50              | 25              | 47                       | 22                 |             |
| JUN. 11 - JUN. 20                               | 73              | 37              | 2                        |                    | 35          |
| JUN. 21 - JUN. 30                               | 13              | 7               | 0                        |                    | 7           |
| JUL. 1 - JUL. 10                                | 25              | 13              | 0                        |                    | 13          |
| JUL. 11 - JUL. 20                               | 0               | 0               | 0                        | 0                  |             |
| JUL. 21 - JUL. 30                               | 0               | 0               | 28                       | 28                 |             |
| AUG. 1 - AUG. 10                                | 2               | 1               | 1                        |                    | 0           |
| AUG. 11 - AUG. 20                               | 0               | 0               | 0                        | 0                  |             |
| AUG. 21 - AUG. 31                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 1 - SEP. 10                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 11 - SEP. 20                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 21 - SEP. 30                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 1 - OCT. 10                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 11 - OCT. 20                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 21 - OCT. 31                               | 0               | 0               | 0                        | 0                  |             |

TOTAL - cfs-days  
- acre-feet

513  
1,018

259  
514

167  
331

## BATTLE CREEK

The computed natural flow of Battle Creek at the International Boundary from March 1 to October 31, 1981, was 8900 dam<sup>3</sup> (7,220 acre-feet) or 27 percent of the average natural flow of the previous 41 years of record. Each country is entitled to 50 percent of the natural flow. A total flow of 5610 dam<sup>3</sup> (4,550 acre-feet) was recorded at the International Boundary.

Deficit deliveries were recorded in 6 of the 24 division periods during the season. No difficulty was experienced in refunding these deficits. A return flow of 35 percent, based on a 1972-76 study, was used for the Gaff Ditch diversion from Battle Creek. The recorded flow at Gaff Ditch near Merryflat from March 1 to October 31, 1981, was 1510 dam<sup>3</sup> (1,230 acre-feet) with the return flow estimated at 529 dam<sup>3</sup> (429 acre-feet). During the irrigation period the return flow for Vidora, Richardson, and McKinnon Ditches was computed to be 19 percent and for Nashlyn Canal to be 10 percent.

A supplementary gauging station was operated during 1981 on Shepherd Ditch, a private diversion on Battle Creek located downstream from Gaff Ditch. A total diversion of 788 dam<sup>3</sup> (639 acre-feet) was recorded at this station during 1981, and is included in the list of miscellaneous diversions for Battle Creek in Appendix B.

The division of the Battle Creek natural flow is summarized in Tables 3 and 3A. The detailed computation of the natural flow is given in Table 11 and the historical summary in Table 12 of Appendix A.



**TABLE 3**  
**SUMMARY OF BATTLE CREEK DIVISION**  
**1981**

QUANTITIES IN CUBIC DECAMETRES

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | U.S.A.<br>SHARE | RECEIVED<br>BY<br>U.S.A. | RECEIVED BY U.S.A. |             |
|---|-----------------|-----------------|--------------------------|--------------------|-------------|
|   |                 |                 |                          | ABOVE SHARE        | BELOW SHARE |
| MAR. 1 - MAR. 14                                | 1016            | 508             | 740                      | 232                |             |
| MAR. 15 - MAR. 25                               | 803             | 402             | 244                      |                    | 158         |
| MAR. 26 - APR. 4                                | 535             | 268             | 188                      |                    | 80          |
| APR. 5 - APR. 14                                | 297             | 149             | 86                       |                    | 63          |
| APR. 15 - APR. 24                               | 353             | 177             | 120                      |                    | 57          |
| APR. 25 - MAY 4                                 | 258             | 129             | 128                      |                    | 1           |
| MAY 5 - MAY 14                                  | 497             | 249             | 527                      | 278                |             |
| MAY 15 - MAY 25                                 | 1239            | 620             | 1182                     | 562                |             |
| MAY 26 - JUN. 4                                 | 445             | 223             | 498                      | 275                |             |
| JUN. 5 - JUN. 14                                | 465             | 233             | 382                      | 149                |             |
| JUN. 15 - JUN. 24                               | 1885            | 943             | 485                      |                    | 458         |
| JUN. 25 - JUL. 4                                | 335             | 168             | 189                      | 21                 |             |
| JUL. 5 - JUL. 14                                | 128             | 64              | 142                      | 78                 |             |
| JUL. 15 - JUL. 25                               | 358             | 179             | 466                      | 287                |             |
| JUL. 26 - AUG. 4                                | 217             | 109             | 178                      | 69                 |             |
| AUG. 5 - AUG. 14                                | 63              | 32              | 52                       | 20                 |             |
| AUG. 15 - AUG. 25                               | 4               | 2               | 3                        | 1                  |             |
| AUG. 26 - SEP. 4                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 5 - SEP. 14                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 15 - SEP. 24                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 25 - OCT. 4                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 5 - OCT. 14                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 15 - OCT. 25                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 26 - OCT. 31                               | 0               | 0               | 0                        | 0                  |             |

TOTAL - cubic decametres    8898                      4455                      5610

50-2-80 2

**TABLE 3A**  
**SUMMARY OF BATTLE CREEK DIVISION**  
**1981**

QUANTITIES IN CFS-DAYS

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | U.S.A.<br>SHARE | RECEIVED<br>BY<br>U.S.A. | RECEIVED BY U.S.A. |             |
|---|-----------------|-----------------|--------------------------|--------------------|-------------|
|   |                 |                 |                          | ABOVE SHARE        | BELOW SHARE |
| MAR. 1 - MAR. 14                                | 415             | 208             | 302                      | 94                 |             |
| MAR. 15 - MAR. 25                               | 328             | 164             | 99                       |                    | 65          |
| MAR. 26 - APR. 4                                | 219             | 110             | 77                       |                    | 33          |
| APR. 5 - APR. 14                                | 121             | 61              | 35                       |                    | 26          |
| APR. 15 - APR. 24                               | 144             | 72              | 49                       |                    | 23          |
| APR. 25 - MAY 4                                 | 105             | 53              | 52                       |                    | 1           |
| MAY 5 - MAY 14                                  | 203             | 102             | 215                      | 113                |             |
| MAY 15 - MAY 25                                 | 506             | 253             | 483                      | 230                |             |
| MAY 26 - JUN. 4                                 | 182             | 91              | 204                      | 113                |             |
| JUN. 5 - JUN. 14                                | 190             | 95              | 156                      | 61                 |             |
| JUN. 15 - JUN. 24                               | 770             | 385             | 198                      |                    | 187         |
| JUN. 25 - JUL. 4                                | 137             | 69              | 77                       | 8                  |             |
| JUL. 5 - JUL. 14                                | 52              | 26              | 58                       | 32                 |             |
| JUL. 15 - JUL. 25                               | 146             | 73              | 190                      | 117                |             |
| JUL. 26 - AUG. 4                                | 89              | 45              | 73                       | 28                 |             |
| AUG. 5 - AUG. 14                                | 26              | 13              | 21                       | 8                  |             |
| AUG. 15 - AUG. 25                               | 2               | 1               | 1                        | 0                  |             |
| AUG. 26 - SEP. 4                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 5 - SEP. 14                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 15 - SEP. 24                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 25 - OCT. 4                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 5 - OCT. 14                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 15 - OCT. 25                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 26 - OCT. 31                               | 0               | 0               | 0                        | 0                  |             |
| TOTAL - cfs-days                                | 3,635           | 1,821           | 2,290                    |                    |             |
| TOTAL - acre-feet                               | 7,210           | 3,612           | 4,542                    |                    |             |



## FRENCHMAN RIVER

The computed natural flow of the Frenchman River at the International Boundary from March 1 to October 31, 1981, was 18 140 dam<sup>3</sup> (14,710 acre-feet) or 21 percent of the average natural flow of the previous 41 years of record. Each country is entitled to 50 percent of the natural flow. A total runoff of 8300 dam<sup>3</sup> (6,730 acre-feet) was recorded at the International Boundary.

Deficit deliveries were recorded in 7 of the 24 division periods during the season. The irrigation season deficit of 767 dam<sup>3</sup> (622 acre-feet) was the result of extremely dry conditions, which resulted in an underestimating of the minor diversions used in the interim natural-flow calculations. The minor diversions were 17 percent of the natural flow based on the year-end minor diversion reports from Saskatchewan Environment, whereas the value used in the interim calculations, and based on historical information, was 5 percent. In the future, especially during dry years, it is essential that Canada obtain a more precise figure for minor diversions early in the irrigation season so that any error in the interim diversion calculations will be minimized.

The division of the Frenchman River natural flow is summarized in Tables 4 and 4A. The detailed computation of the natural flow is given in Table 13 and the historical summary in Table 14 of Appendix A.

**TABLE 4**  
**SUMMARY OF FRENCHMAN RIVER DIVISION**  
**1981**

QUANTITIES IN CUBIC DECAMETRES

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | U.S.A.<br>SHARE | RECEIVED<br>BY<br>U.S.A. | RECEIVED BY U.S.A. |             |
|---|-----------------|-----------------|--------------------------|--------------------|-------------|
|   |                 |                 |                          | ABOVE SHARE        | BELOW SHARE |
| MAR. 1 - MAR. 10                                | 3646            | 1823            | 607                      |                    | 1216        |
| MAR. 11 - MAR. 20                               | 2436            | 1218            | 196                      |                    | 1022        |
| MAR. 21 - MAR. 31                               | 1103            | 552             | 85                       |                    | 467         |
| APR. 1 - APR. 10                                | 935             | 468             | 33                       |                    | 435         |
| APR. 11 - APR. 20                               | 455             | 228             | 10                       |                    | 218         |
| APR. 21 - APR. 30                               | 809             | 405             | 967                      | 562                |             |
| MAY 1 - MAY 10                                  | 594             | 297             | 725                      | 428                |             |
| MAY 11 - MAY 20                                 | 1238            | 619             | 896                      | 277                |             |
| MAY 21 - MAY 31                                 | 1042            | 521             | 694                      | 173                |             |
| JUN. 1 - JUN. 10                                | 1320            | 660             | 1312                     | 652                |             |
| JUN. 11 - JUN. 20                               | 859             | 430             | 1057                     | 627                |             |
| JUN. 21 - JUN. 30                               | 1122            | 561             | 78                       |                    | 483         |
| JUL. 1 - JUL. 10                                | 451             | 226             | 1                        |                    | 225         |
| JUL. 11 - JUL. 20                               | 950             | 475             | 654                      | 179                |             |
| JUL. 21 - JUL. 30                               | 1068            | 534             | 860                      | 326                |             |
| AUG. 1 - AUG. 10                                | 110             | 55              | 130                      | 75                 |             |
| AUG. 11 - AUG. 20                               | 0               | 0               | 0                        | 0                  |             |
| AUG. 21 - AUG. 31                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 1 - SEP. 10                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 11 - SEP. 20                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 21 - SEP. 30                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 1 - OCT. 10                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 11 - OCT. 20                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 21 - OCT. 31                               | 0               | 0               | 0                        | 0                  |             |

TOTAL - cubic decametres

18138

9072

8305

**TABLE 4A**  
**SUMMARY OF FRENCHMAN RIVER DIVISION**  
**1981**

QUANTITIES IN CFS-DAYS

| DIVISION PERIOD<br>AT<br>INTERNATIONAL BOUNDARY | NATURAL<br>FLOW | U.S.A.<br>SHARE | RECEIVED<br>BY<br>U.S.A. | RECEIVED BY U.S.A. |             |
|---|-----------------|-----------------|--------------------------|--------------------|-------------|
|   |                 |                 |                          | ABOVE SHARE        | BELOW SHARE |
| MAR. 1 - MAR. 10                                | 1,490           | 745             | 248                      |                    | 497         |
| MAR. 11 - MAR. 20                               | 996             | 498             | 80                       |                    | 418         |
| MAR. 21 - MAR. 31                               | 451             | 226             | 35                       |                    | 191         |
| APR. 1 - APR. 10                                | 382             | 191             | 13                       |                    | 178         |
| APR. 11 - APR. 20                               | 186             | 93              | 4                        |                    | 89          |
| APR. 21 - APR. 30                               | 331             | 166             | 395                      | 229                |             |
| MAY 1 - MAY 10                                  | 243             | 121             | 296                      | 175                |             |
| MAY 11 - MAY 20                                 | 506             | 253             | 366                      | 113                |             |
| MAY 21 - MAY 31                                 | 426             | 213             | 284                      | 71                 |             |
| JUN. 1 - JUN. 10                                | 539             | 270             | 536                      | 266                |             |
| JUN. 11 - JUN. 20                               | 351             | 176             | 432                      | 256                |             |
| JUN. 21 - JUN. 30                               | 459             | 229             | 32                       |                    | 197         |
| JUL. 1 - JUL. 10                                | 184             | 92              | 0                        |                    | 92          |
| JUL. 11 - JUL. 20                               | 388             | 194             | 267                      | 73                 |             |
| JUL. 21 - JUL. 30                               | 436             | 218             | 351                      | 133                |             |
| AUG. 1 - AUG. 10                                | 45              | 22              | 53                       | 31                 |             |
| AUG. 11 - AUG. 20                               | 0               | 0               | 0                        | 0                  |             |
| AUG. 21 - AUG. 31                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 1 - SEP. 10                                | 0               | 0               | 0                        | 0                  |             |
| SEP. 11 - SEP. 20                               | 0               | 0               | 0                        | 0                  |             |
| SEP. 21 - SEP. 30                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 1 - OCT. 10                                | 0               | 0               | 0                        | 0                  |             |
| OCT. 11 - OCT. 20                               | 0               | 0               | 0                        | 0                  |             |
| OCT. 21 - OCT. 31                               | 0               | 0               | 0                        | 0                  |             |

TOTAL - cfs-days  
- acre-feet

|        |       |       |
|--------|-------|-------|
| 7,413  | 3,707 | 3,392 |
| 14,704 | 7,353 | 6,728 |

ANNEX A

TREATY BETWEEN THE UNITED STATES AND GREAT BRITAIN  
RELATING TO BOUNDARY WATERS; AND QUESTIONS ARISING  
BETWEEN THE UNITED STATES AND CANADA - ARTICLE VI

INTERNATIONAL JOINT COMMISSION  
1921 Order



TREATY  
BETWEEN THE UNITED STATES AND GREAT  
BRITAIN RELATING TO BOUNDARY WATERS;  
AND QUESTIONS ARISING BETWEEN THE  
UNITED STATES AND CANADA

ARTICLE VI

The High Contracting Parties agree that the St. Mary and Milk Rivers and their tributaries (in the State of Montana and the Provinces of Alberta and Saskatchewan) are to be treated as one stream for the purposes of irrigation and power, and the waters thereof shall be apportioned equally between the two countries, but in making such equal apportionment more than half may be taken from one river and less than half from the other by either country so as to afford a more beneficial use to each. It is further agreed that in the division of such waters during the irrigation season, between the 1st of April and 31st of October, inclusive, annually, the United States is entitled to a prior appropriation of 500 cubic feet per second of the waters of the Milk River, or so much of such amount as constitutes three-fourths of its natural flow, and that Canada is entitled to a prior appropriation of 500 cubic feet per second of the flow of St. Mary River, or so much of such amount as constitutes three-fourths of its natural flow.

The Channel of the Milk River in Canada may be used at the convenience of the United States for the conveyance, while passing through Canadian territory, of waters diverted from the St. Mary River. The provisions of Article II of this treaty shall apply to any injury resulting to property in Canada from the conveyance of such waters through the Milk River.

The measurement and apportionment of the water to be used by each country shall from time to time be made jointly by the properly constituted reclamation officers of the United States and the properly constituted irrigation officers of His Majesty under the direction of the International Joint Commission.



## INTERNATIONAL JOINT COMMISSION

### ORDER

IN THE MATTER OF THE MEASUREMENT AND APPORTIONMENT OF THE WATERS OF THE ST. MARY AND MILK RIVERS AND THEIR TRIBUTARIES IN THE STATE OF MONTANA AND THE PROVINCES OF ALBERTA AND SASKATCHEWAN.

Whereas by Article VI of the Treaty entered into between the United States of America and His Majesty, the King of the United Kingdom of Great Britain and Ireland and of the British Dominions beyond the Seas, Emperor of India, signed at Washington on the 11th of January, 1909;

And whereas the said Reclamation and Irrigation Officers have been unable to agree as to the manner in which the waters mentioned in the said Article VI should be measured and apportioned;

And whereas, before giving directions as to the measurement and apportionment of the said waters, the International Joint Commission deemed it proper to hear such representations and suggestions thereon as the Governments of the United States and Canada, the Provinces of Alberta and Saskatchewan, and the State of Montana, and as corporations and persons interested might see fit to make, and for such purposes sittings of the Commission were held at the following times and places: At the city of St. Paul, in the State of Minnesota, on the 24th, 25th, 26th, 27th, and 28th days of May, 1915; at the city of Detroit, in the State of Michigan, on the 15th, 16th, and 17th days of May, 1917; at the city of Ottawa, in the Province of Ontario, on the 3rd, 4th, and 5th days of May, 1920; at the village of Chinook, in the State of Montana, on the 15th day of September, 1921; and at the city of Lethbridge, in the Province of Alberta, on the 17th day of September, 1921, when counsel and representatives of the said Governments, corporations, and persons appeared and presented their views;

And whereas, pending final decision as to the proper method of measuring and apportioning said waters, interim orders with reference thereto have been made by the International Joint Commission from time to time, the last of such orders bearing the date of 5th day of April, 1921;

And whereas the members of the International Joint Commission have unanimously determined that the said Reclamation and Irrigation Officers should be guided in the measurement and apportionment of said waters by the directions and instructions hereinafter set forth:

IT IS THEREFORE ORDERED AND DIRECTED by the Commission in pursuance of the powers conferred by the said Article VI of the said Treaty that the Reclamation and Irrigation Officers of the United States and Canada shall, until this order is varied, modified, or withdrawn by the Commission, make jointly the measurement and apportionment of the water to be used by the United States and Canada in accordance with the following rules:

#### St. Mary River.

I. (a) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is six hundred and sixty-six (666) cubic feet per second or less Canada shall be entitled to three-fourths and the United States to one-fourth of such flow.

(b) During the irrigation season when the natural flow of the St. Mary River at the point where it crosses the international boundary is more than six hundred and sixty-six (666) cubic feet per second Canada shall be entitled to a prior appropriation of five hundred (500) cubic feet per second, and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the non-irrigation season the natural flow of the St. Mary River at the point where it crosses the international boundary shall be divided equally between the two countries.

#### Milk River.

II. (a) During the irrigation season when the natural flow of the Milk River at the point where it crosses the international boundary for the last time (commonly and hereafter called the Eastern Crossing) is six hundred and sixty-six (666) cubic feet per second or less, the United States shall be entitled to three-fourths and Canada to one-fourth of such natural flow.

(b) During the irrigation season when the natural flow of the Milk River at the Eastern Crossing is more than six hundred and sixty-six (666) cubic feet per second the United States shall be entitled to a prior appropriation of five hundred (500) cubic feet per second and the excess over six hundred and sixty-six (666) cubic feet per second shall be divided equally between the two countries.

(c) During the non-irrigation season the natural flow of the Milk River at the Eastern Crossing shall be divided equally between the two countries.

#### Eastern Tributaries of Milk River.

III. The natural flow of the eastern (otherwise known as the Saskatchewan or northern) tributaries of the Milk River at the points where they cross the international boundary shall be divided equally between the two countries.

#### Waters not naturally crossing the boundary.

IV. Each country shall be apportioned such waters of the said rivers and of any tributaries thereof as rise in that country but do not naturally flow across the international boundary.

V. For the purpose of carrying out the apportionment directed in Paragraphs I, II, and III hereof the said Reclamation and Irrigation Officers shall jointly take steps:

(a) To ascertain and keep a daily record of the natural flow of the St. Mary River at the international boundary, of the Milk River at the Eastern Crossing, and of the eastern tributaries of the Milk River at the international boundary by measurement in each case:

(1) At the gauging station at the international boundary;

(2) At all places where any of the waters which would naturally flow across the international boundary at that particular point are diverted in either country prior to such crossing;

(3) At all places where any of the waters which would naturally flow across the international boundary at that particular point are stored, or the natural flow thereof increased or decreased prior to such crossing.



(b) To fix the amount of water to which each country is entitled in each case by applying the directions contained in paragraphs 1, 2, and 3 hereof to the total amount of the natural flow so ascertained in each case.

(c) To communicate the amount so fixed to all parties interested, so that the apportionment of the said waters may be fully carried out by both countries in accordance with the said directions.

VI. Each country may receive its share of the said waters as so fixed at such point or points as it may desire. A gauging station shall be established and maintained by the Reclamation or Irrigation Officers of the country in which any diversion, storage, increase, or decreases of the natural flow shall be made at every point where such diversion, storage, increase, or decrease takes place.

VII. International gauging stations shall be maintained at the following points:

St. Mary River near international boundary; the north branch of Milk River near international boundary; the south branch of Milk River near international boundary; Milk River at Eastern Crossing; Lodge Creek, Battle Creek, and Frenchman River, near international boundary; and gauging stations shall be established and maintained at such other points as the Commission may from time to time approve.

VIII. The said Reclamation and Irrigation Officers are hereby further authorized and directed:

(a) To make such additional measurements and to take such further and other steps as may be necessary or advisable in order to insure the apportionment of the said waters in accordance with the directions herein set forth.

(b) To operate the irrigation works of either country in such a manner as to facilitate the use by the other country of its share of the said waters and subject hereto to secure to the two countries the greatest beneficial use thereof.

(c) To report to the Commission the measurements made at all international and other gauging stations established pursuant to this order.

IX. In the event of any disagreement in respect to any matter or thing to be done under this order the said Reclamation and Irrigation Officers shall report to the Commission, setting forth fully the points of difference and the facts relating thereto.

X. The said order of the Commission, dated the 6th day of April 1921, is hereby withdrawn, except with respect to the report to be furnished to the Commission thereunder.

Dated at Ottawa, Canada, this 4th day of October, 1921.

O. GARDNER,  
C. A. MACGRATH,  
C. D. CLARK,  
HENRY A. POWELL,  
W. H. HEARST,  
MARK A. SMITH.

ANNEX B

International System of Units

(SI) Conversions



## IMPERIAL TO INTERNATIONAL SYSTEM OF UNITS

### (SI) CONVERSION

The 1981 Report to the International Joint Commission on the Division of the Waters of the St. Mary and Milk Rivers uses dual units (SI and Imperial).

The two Imperial units that have been used in previous reports are cfs-days and acre-feet.

1 cfs-day = 86,400 cubic feet

1 acre-foot = 43,560 cubic feet

1 cfs-day = 1.9835 acre-feet

The SI unit replacing the Imperial units is the cubic decametre ( $\text{dam}^3$ )

1  $\text{dam}^3$  = 1000 cubic metres

1 cubic metre = 35.315 cubic feet

1  $\text{dam}^3$  = 35,315 cubic feet

1 acre-foot = 1.2335  $\text{dam}^3$

1 cfs-day = 2.4466  $\text{dam}^3$

ANNEX C

List of Gauging Stations

INTERNATIONAL GAUGING STATIONS OPERATED JOINTLY

BY

CANADA AND UNITED STATES

ST. MARY AND MILK RIVER DRAINAGE BASINS

1981

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Map Index

Stream and Location

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ST. MARY RIVER BASIN

|         |  |
|---------|--|
| 05AE027 | St. Mary River at International Boundary               |
| 05AE029 | St. Mary Canal at St. Mary Crossing near Babb, Montana |
| 05AE033 | Swiftcurrent Creek at Sherburne, Montana               |
| 05AE036 | Lake Sherburne at Sherburne, Montana                   |

MILK RIVER BASIN

|         |   |
|---------|---|
| 11AA001 | North Milk River near International Boundary                      |
| 11AA005 | Milk River at Milk River  |
| 11AA025 | Milk River at Western Crossing of International Boundary          |
| 11AA031 | Milk River at Eastern Crossing of International Boundary          |
| 11AA032 | North Fork Milk River above St. Mary Canal near Browning, Montana |
| 11AA033 | South Fork Milk River near Babb, Montana                          |

LODGE CREEK TRIBUTARY BASIN

|         |   |
|---------|---|
| 11AB001 | Middle Creek below Middle Creek Reservoir               |
| 11AB009 | Middle Creek near Alberta Boundary                      |
| 11AB060 | Spangler Ditch near Govenlock                           |
| 11AB080 | Middle Creek Reservoir                                  |
| 11AB083 | Lodge Creek below McRae Creek at International Boundary |
| 11AB089 | Altawan Reservoir near Govenlock                        |

BATTLE CREEK TRIBUTARY BASIN

|         |  |
|---------|--|
| 11AB018 | Nashlyn Canal near Consul              |
| 11AB027 | Battle Creek at International Boundary |
| 11AB044 | McKinnon Ditch near Consul             |
| 11AB058 | Richardson Ditch near Consul           |
| 11AB075 | Lyons Creek at International Boundary  |
| 11AB077 | Cypress Lake West Outflow Canal        |
| 11AB078 | Cypress Lake West Inflow Canal         |
| 11AB084 | Vidora Ditch near Consul               |
| 11AB085 | Cypress Lake West Inflow Canal Drain   |
| 11AB102 | Gaff Ditch near Merryflat              |

FRENCHMAN RIVER TRIBUTARY BASIN

|         |   |
|---------|---|
| 11AC001 | Frenchman River below Eastend Reservoir   |
| 11AC037 | Cypress Lake                              |
| 11AC041 | Frenchman River at International Boundary |
| 11AC052 | Eastend Canal                             |
| 11AC054 | Newton Lake Main Canal                    |
| 11AC055 | Eastend Reservoir                         |
| 11AC056 | Newton Lake                               |
| 11AC060 | Cypress Lake East Outflow Canal           |
| 11AC062 | Frenchman River below Newton Lake         |
| 11AC063 | Huff Lake                                 |
| 11AC064 | Belanger Creek Diversion to Cypress Lake  |
| 11AC065 | Huff Lake Gravity Canal                   |
| 11AC066 | Huff Lake Pumping Canal                   |



GAUGING STATIONS OPERATED INDEPENDENTLY

BY EITHER

CANADA OR UNITED STATES

IN THE

ST. MARY AND MILK RIVER DRAINAGE BASINS

1981

| Map Index                   | Stream and Location   | Operated by |
|-----------------------------|---|-------------|
| <u>ST. MARY RIVER BASIN</u> |   |             |
| 5-0145*                     | Swiftcurrent Creek at Many Glacier,<br>Montana              | U.S.A.      |
| 5-0175*                     | St. Mary River near Babb, Montana                           | U.S.A.      |
| 6-1695*                     | Rock Creek below Horse Creek near<br>International Boundary | U.S.A.      |
| 05AE002*                    | Lee Creek at Cardston                                       | Canada      |
| 05AE005*                    | Rolph Creek near Kimball                                    | Canada      |
| 05AE006*                    | St. Mary River near Lethbridge                              | Canada      |
| 05AE016*                    | Pothole Creek at Russell's Ranch                            | Canada      |
| 05AE021*                    | Magrath Irrigation District Canal<br>near Spring Coulee     | Canada      |
| 05AE025*                    | St. Mary Reservoir near Spring<br>Coulee                    | Canada      |
| 05AE026*                    | Canadian St. Mary Canal near Spring<br>Coulee               | Canada      |
| 05AE038*                    | Pothole Turnout near Magrath                                | Canada      |
| 05AE041*                    | Dry Coulee near Magrath                                     | Canada      |

MILK RIVER BASIN

|          |   |        |
|----------|---|--------|
| 11AA028* | Bear Creek near International Boundary    | Canada |
| 11AA029* | Miners Coulee near International Boundary | Canada |
| 11AA034* | Milk River near Writing-on-Stone Park     | Canada |
| 11AA035* | Milk River near Pendant d'Oreille         | Canada |

LODGE CREEK TRIBUTARY BASIN

|          |                                       |        |
|----------|---------------------------------------|--------|
| 11AB008* | Middle Creek above Lodge Creek        | Canada |
| 11AB082* | Lodge Creek at Alberta Boundary       | Canada |
| 11AB091  | Michele Reservoir near Elkwater       | Canada |
| 11AB092  | Greasewood Reservoir near Elkwater    | Canada |
| 11AB094  | Bare Creek Reservoir near Elkwater    | Canada |
| 11AB097  | Cressday Reservoir near Cressday      | Canada |
| 11AB098  | Jaydot Reservoir near Jaydot          | Canada |
| 11AB099  | Mitchell Reservoir near Elkwater      | Canada |
| 11AB103  | Squaw Coulee near Willow Creek        | Canada |
| 11AB104  | Massy Reservoir near Elkwater         | Canada |
| 11AB108* | Middle Creek near Govenlock           | Canada |
| 11AB113  | Middle Creek Reservoir Main Outlet    | Canada |
| 11AB114  | Middle Creek Reservoir Bedford Outlet | Canada |
| 11AB115  | Middle Creek Reservoir Flood Spillway | Canada |

BATTLE CREEK TRIBUTARY BASIN

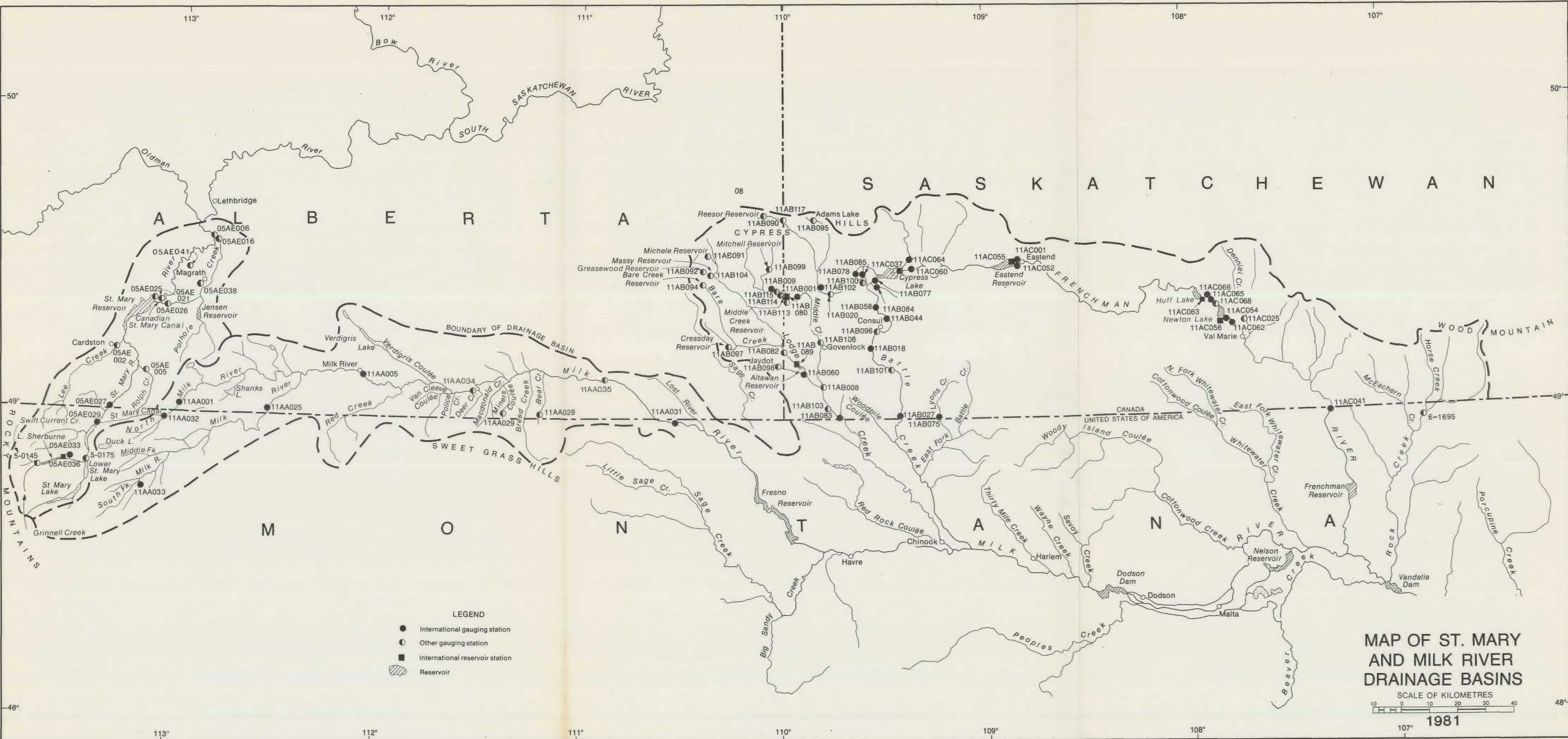
|          |   |        |
|----------|---|--------|
| 11AB020* | Shepherd Ditch near Consul                            | Canada |
| 11AB090  | Reesor Reservoir                                      | Canada |
| 11AB095  | Adams Lake  | Canada |
| 11AB096* | Battle Creek near Consul                              | Canada |
| 11AB100* | Battle Creek above Cypress Lake West<br>Outflow Canal | Canada |
| 11AB101* | Battle Creek below Nashlyn Project                    | Canada |
| 11AB117* | Battle Creek at Alberta Boundary                      | Canada |

FRENCHMAN RIVER TRIBUTARY BASIN

|          |                              |        |
|----------|------------------------------|--------|
| 11AC025* | Denniel Creek near Val Marie | Canada |
| 11AC068  | Val Marie Pump No. 1         | Canada |

\* Data not included in this report or appendices





- LEGEND
- International gauging station
  - Other gauging station
  - International reservoir station
  - ▨ Reservoir

MAP OF ST. MARY  
AND MILK RIVER  
DRAINAGE BASINS

SCALE OF KILOMETRES

0 10 20 30 40

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Commission on the division and use  
of the waters of the St. Mary and  
Milk Rivers...

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