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FIFTY-SIXTH ANNUAL REPORT

TO THE International Joint Commission

COVERING Calendar Year 2014

International Souris River Board

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INTERNATIONAL SOURIS
RIVER BOARD

CONSEIL INTERNATIONALE
DE LA RIVIERE SOURIS

October 2015

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

Commissioners:

In accordance with the Directive of January 22, 2007 (replaces Directives of April 11, 2002 and May 31, 1959), we have enclosed the Fifty-Sixth Annual Report covering calendar year 2014.

Respectively submitted,

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For the 2014 calendar year, the natural flow of the Souris River at the Sherwood Crossing was 278 835 cubic decametres (226,052 acre-feet), which represents 173 percent of the 1959-2014 long-term mean. North Dakota received 285 526 cubic decametres (231,476 acre-feet) or 102 percent of the natural flow.

Net depletions in Canada were 6 691 cubic decametres (5,424 acre-feet). Recorded runoff for the Souris River near Sherwood, North Dakota, was 283 455 cubic decametres (229,797 acre-feet), or about 207 percent of the 1931-2014 long-term mean.

The apportionment between Canada and the United States was discussed at the February 20, 2014 meeting of the International Souris River Board. The Board tabled a decision whether to declare 2014 a flood or non-flood event. A conference call was held on March 20 to review the hydrologic conditions and determine the flood event. The Board agreed to declare the spring 2014 as a non-flood year (less than 1:10 event) after carefully considering hydrologic conditions as of March 20.

The August 31, 2014 Determination of Natural Flow showed a surplus of 106 217 cubic decametres (86,110 acre-feet) to the United States. Calculations made after the end of the year indicated that Saskatchewan was in surplus to the United States by 173 996 cubic decametres (141,059 acre-feet). The natural flow at Sherwood exceeded 50 000 cubic decametres (40,535 acre-feet), resulting in a 60/40 sharing of the natural flow at the Sherwood Crossing.

The flow of the Souris River as it enters North Dakota at Sherwood was more than 0.113 cubic metres per second (4 cubic feet per second) for the entire year. Accordingly, Saskatchewan complied with the 0.113 cubic metres per second (4 cubic feet per second) provision specified in Recommendation No. 1 of the Interim Measures.

Recorded runoff for Long Creek at the Western Crossing as it enters North Dakota was 21 191 cubic decametres (17,180 acre-feet), or 67 percent of the long-term mean since 1959. Recommendation No. 2 of the Interim Measures was met with a net gain in the North Dakota portion of the Long Creek basin of 17 167 cubic decametres (13,917 acre-feet).

Recorded runoff leaving the United States at Westhope during the period of June 1 through October 31, 2012, was 602 899 cubic decametres (488,730 acre-feet). The flow was in compliance with the 0.566 cubic metres per second (20 cubic feet per second) minimum flow requirement for the June 01 to October 31 period as specified in Recommendation No. 3(a) of the Interim Measures.

The water quality of the Souris River in calendar year 2014 was slightly improved compared to historical data. Phosphorus levels above the water quality objective continue to be a concern. This year however, showed decreases in the number of exceedances in several parameters, as well as a drop in the median values of many others compared to last year.

Dissolved oxygen levels were all above the water quality objective of 5.0 milligrams per liter throughout the year at both boundary stations. It is believed that several years of continual flow throughout the winter, as well as the scouring that occurred with the 2011 flood have played a role in improving water quality conditions.

Exceedances of specific water quality objectives at the Saskatchewan/North Dakota boundary include phosphorus, sodium, and iron. The high levels of iron are thought to coincide with the high water table in iron rich soils that exist throughout the watershed, especially near the Saskatchewan/North Dakota border.

Exceedances of specific water quality objectives at the Manitoba/North Dakota boundary include phosphorus, sodium, sulphate, total dissolved solids, iron, and pH.

In 2014, the International Joint Commission appointed Dave Glatt to the International Souris River Board.

1.0 INTERNATIONAL SOURIS RIVER BOARD

1.1 SOURIS RIVER REFERENCE (1940)

The following excerpt describes the history of the water-apportionment program that the International Souris River Board currently maintains.

In a letter on behalf of the Government of Canada dated 20 March 1959 and a letter on behalf of the Government of the United States of America dated 3 April 1959, the International Joint Commission was informed that the Interim Measures recommended in its report of 19 March 1958, in substitution for those recommended in the report dated 2 October 1940 in response to the Souris River Reference (1940), had been accepted by both Governments.

The Governments of the United States and Canada entered into an Agreement for Water Supply and Flood Control in the Souris River Basin on October 26, 1989. Pursuant to this Agreement, the Interim Measures related to the sharing of the annual flow of the Souris River from Saskatchewan into North Dakota contained in paragraph 22(1) of the Commission's 1958 Report to the Governments were modified. In light of the modifications in 1989 and pursuant to a February 28, 1992, request from the Governments of the United States and Canada, the Commission, on April 23, 1992, directed the International Souris River Board of Control to begin applying the "Interim Measures as Modified in 1992." The measures were further modified by the Governments in December 2000. The "Interim Measures as Modified in 2000" are shown in Appendix C of this report.

1.2 INTERIM MEASURES AS MODIFIED IN 2000

In December 2000, the International Joint Commission directed the Board to implement the "Interim Measures as Modified in 2000" for the 2001 calendar year and each year thereafter. The 2000 Interim Measures, shown in Appendix C, were developed to provide greater clarification of the conditions that must prevail for the determination of the sharing of natural flow between Saskatchewan and North Dakota at the Sherwood Crossing.

In general, the Interim Measures provide that Saskatchewan shall have the right to divert, store, and use waters that originate in the Saskatchewan portion of the Souris River basin, provided that the annual runoff of the river into North Dakota is not thereby reduced to less than half of the runoff that would have occurred in a state of nature; that North Dakota shall have the right to divert, store, and use the waters that originate in the North Dakota portion of the basin together with the waters that cross the boundary from Saskatchewan; and that Manitoba shall have the right to use the waters that originate in the Manitoba portion of the basin and, in addition, that North Dakota must provide to Manitoba, except during periods of severe drought, a regulated flow of at least 0.566 cubic metres per second (20 cubic feet per second) during the months of June through October.

For the benefit of riparian users of water between the Sherwood Crossing and the upstream end of Lake Darling, the Province of Saskatchewan shall as far as practicable regulate its diversions, storage, and uses in such a manner that the flow in the Souris River channel at the Sherwood Crossing shall not be less than 0.113 cubic metres per second (4 cubic feet per second) when that level of flow would have occurred under the conditions of water-use development prevailing in the Saskatchewan portion of the drainage basin prior to the construction of Boundary Dam, Rafferty Dam, and Alameda Dam.

Under certain conditions, a portion of the North Dakota share will be in the form of evaporation from Rafferty and Alameda Reservoirs. During years when those conditions occur, the minimum flow actually passed to North Dakota will be 40 percent of the natural flow at the Sherwood Crossing. This lesser amount is in recognition of Saskatchewan's operation of Rafferty Dam and Alameda Dam for flood control.

Except in flood years, flow releases to the United States should occur in the pattern that would have occurred in a state of nature. To the extent possible and in consideration of potential channel losses and operating efficiencies, releases from the Canadian dams will be scheduled to coincide with periods of beneficial use in North Dakota. The flow release to the United States may be delayed when the State of North Dakota determines and notifies Saskatchewan through the International Souris River Board that the release would not be of benefit to the State at that time.

The State of North Dakota shall have the right to divert, store, and use the waters that originate in the North Dakota portion of the Souris River basin together with the waters delivered to the State of North Dakota at the Sherwood Crossing, provided that any diversion, use, or storage of Long Creek water shall not diminish the annual runoff at the Eastern Crossing of Long Creek into Saskatchewan below the annual runoff of Long Creek at the Western Crossing into North Dakota.

In periods of severe drought, when it becomes impracticable for North Dakota to deliver the regulated flow of 0.566 cubic metres per second (20 cubic feet per second), North Dakota's responsibility to Manitoba will be limited to providing such flows as the Board determines to be practicable and in accordance with the objective of making water available for human and livestock consumption as well as for household use.

1.3 BOARD OF CONTROL

In May 1959, the International Joint Commission officially approved and signed a directive that created the International Souris River Board of Control. The directive charged the Board with the responsibility of ensuring compliance with the Interim Measures as set out in 1958 and of submitting such reports as the Commission may require or as the Board at its discretion may desire to file.

1.4 AMALGAMATION OF THE INTERNATIONAL SOURIS-RED RIVERS ENGINEERING BOARD AND INTERNATIONAL SOURIS RIVER BOARD OF CONTROL

In 2000, the International Joint Commission directed the International Souris-Red Rivers Engineering Board to transfer its responsibilities that related to the Souris River to the International Souris River Board of Control. The Commission also changed the International Souris River Board of Control's name to the International Souris River Board.

1.5 AMALGAMATION OF THE INTERNATIONAL SOURIS RIVER BOARD AND SOURIS RIVER BI-LATERAL WATER QUALITY MONITORING GROUP

In 2006 the International Joint Commission changed the Board's mandate. Because of the change in the mandate and the desire of the Commission to move to a more encompassing watershed approach, the Board was requested to develop a directive based on existing Commission responsibilities in the Souris River basin that would move toward an enhanced mandate for the Board. By letter dated January 22, 2007, the International Souris River Board was officially notified by the Commission that the new directive dated January 18, 2007, replaced the previous directive dated April 11, 2002.

The new directive sets out the duties of the Board as it moves toward a watershed approach in the Souris River basin and combined the duties of the International Souris River Board and Souris River Bi-Lateral Water Quality Monitoring Group. It also increased the membership of the Board to twelve members.

The Board's duties were revised to include the following:

- Maintain an awareness of existing and proposed developments, activities, conditions, and issues in the Souris River basin that may have an impact on transboundary water levels, flows, water quality, and aquatic ecosystem health and inform the Commission about existing or potential transboundary issues.

- Oversee the implementation of compliance with the Interim Measures as Modified for Apportionment of the Souris River as described in Appendix A of the Directive.

- Assist the Commission in the review of a Joint Water Quality Monitoring Program.

- Perform an oversight function for flood operations in cooperation with the designated entities identified in the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin.

- Report on aquatic ecosystem health issues in the watershed and regularly inform the Commission on the state and implications of aquatic ecosystem health.

- Carry out such other studies or activities as the Commission may, from time to time, request.

- Prepare an annual work plan including both routine board activities and new initiatives planned to be conducted in the subsequent year.

- The Board shall submit an annual report covering all of its activities at least three weeks in advance of the Commission's fall semi-annual meeting, and the Board shall submit other reports as the Commission may request or the Board may feel appropriate in keeping with this Directive.

- The Board shall provide opportunities for the public to be involved in its work, including at least one public meeting in the basin each year. The Board has agreed to hold the public meeting in the spring/summer and to advertise it.

In 2007 three committees were established to assist with administering the conditions of the Board's mandate. The Natural Flow Methods Committee was renamed as the Hydrology Committee, which is charged with investigating procedures and questions on the approach and methods used to determine the natural flow of the Souris River basin. The Flow Forecasting Liaison Committee has the responsibility to ensure there is information sharing and coordination between the forecasting agencies in the basin. The Aquatic Ecosystem Health Committee has responsibility to identify water quality and aquatic health concerns in the basin and report on the adequacy of the aquatic quality monitoring programs. Membership on these committees includes all affected agencies in the basin.

1.6 BOARD MEMBERS

At the end of 2014, the members of the International Souris River Board were as follow:

Russell Boals Retired (Co-Chair) Regina, Saskatchewan	Member for Canada
John Fahlman Saskatchewan Watershed Authority Moose Jaw, Saskatchewan	Member for Canada
Nicole Armstrong Manitoba Conservation & Water Stewardship Winnipeg, Manitoba	Member for Canada
Mark Lee Saskatchewan Water Security Agency Regina, Saskatchewan	Member for Canada
John-Mark Davies Saskatchewan Water Security Agency Regina, Saskatchewan	Member for Canada
Jeff Woodward Environment Canada Winnipeg, Manitoba	Member for Canada
Todd Sando North Dakota State Engineer Bismarck, North Dakota	Member for the United States (Co-Chair)
Colonel Daniel Koprowski U.S. Army Corps of Engineers St. Paul, Minnesota	Member for the United States
Gregg Wiche U.S. Geological Survey Bismarck, North Dakota	Member for the United States
Megan Estep U.S. Fish and Wildlife Service Denver, Colorado	Member for the United States
Scott Gangl North Dakota Game and Fish Department Bismarck, North Dakota	Member for the United States
Dave Glatt North Dakota Department of Health Bismarck, North Dakota	Member for the United States

2.0 2014 ACTIVITIES OF THE BOARD

Since the presentation of the Fifty - Fifth Annual Report to the International Joint Commission, the International Souris River Board has held two meetings and has had two teleconference calls. The discussions and decisions made are summarized in the following sections.

2.1 FEBRUARY 20, 2014, MEETING IN BISMARCK, NORTH DAKOTA

Members in attendance were:

Russell Boals
Member for Canada

John Fahlman
Member for Canada

Nicole Armstrong
Member for Canada

Mark Lee
Member for Canada

Todd Sando
Member for the United States

Megan Estep
Member for the United States

Gregg Wiche
Member for the United States

Colonel Daniel Koprowski
Member for the United States

Scott Gangl
Member for the United States

The Determination of Natural Flow of the Souris River at Sherwood for the period of January 1 through December 31, 2013, was presented at the February 20, 2014, meeting. The final apportionment balance for the 2013 calendar year showed that Saskatchewan was in surplus to North Dakota by 233 604 cubic decametres (189,383 acre-feet). The summary of the natural flow computations showed that there were continuous high deliveries to the United States since 2009.

The Saskatchewan Water Security Agency said there was a significant snowpack during the 2013 - 2014 winter in the Souris River basin, however, the potential for a significant snowmelt runoff was moderated by dry soil conditions and a relatively slow melt. The runoff into Rafferty Reservoir was approximately a 1:20 flood event. In comparison, the runoff into Alameda was about a 1:10 year event. Based on conditions as of February 1, 2014, both the Saskatchewan Water Security Agency and the National Weather Service projected below median runoff with the assumption of average precipitation for February, March, and April 2014.

Boundary Reservoir was at an elevation of 560.3 metres (1,838.3 feet) on February 1, 2014, above the required pre-runoff drawdown elevation of 560.0 metres (1,837.4 feet). The Saskatchewan Water Security Agency planned to store an additional 18 000 cubic decametres (14,592.6 acre-feet) above the required pre-runoff drawdown elevation of 560.0 metres (1,837.3 feet) in Rafferty. This was to safeguard Boundary Reservoir, which is a critical water supply for the Boundary Thermal power plant and the City of Estevan. No releases were planned from Boundary at that time.

Rafferty Reservoir was at an elevation of 549.5 metres (1,802.8 feet) on February 1, 2014. Releases were made from Rafferty throughout the winter in order to achieve the February 1 target level of 549.5 metres (1,802.8 feet) as per the 1989 Canada-United States Agreement. Based on the 90-day inflow estimate, the required pre-runoff drawdown level was 550.2 metres (1,805.1 feet) as per the

1989 Canada-United States Agreement. Therefore, no additional pre-runoff drawdown was required for Rafferty inflow. However, as noted above an additional 18 000 cubic decametres (14,592.6 acre-feet) of storage was to be made available in lieu of the planned Boundary Reservoir pre-runoff operations.

Alameda Reservoir was at an elevation of 560.95 metres (1,840.37 feet) on February 1, 2014. The maximum elevation for February 1 as specified by the 1989 Canada-United States Agreement is 561.0 metres (1,840.53 feet). Based on the 90-day inflow estimate, the required pre-runoff drawdown level is 561.0 metres (1,840.53 feet) as specified in the 1989 Canada-United States Agreement. Therefore, it was not necessary to draw down Alameda any further before spring runoff.

The United States Geological Survey reported the peak flow at Sherwood was 70.8 cubic metres per second (2,500 cubic feet per second) on April 12, 2013. The peak flow at Westhope was 153 cubic metres per second (5,400 cubic feet per second) on June 20, 2013. Total flow at Westhope for 2013 was 1 047 329 cubic decametres (849,069 acre-feet). The flow at Westhope was in compliance with the 0.566 cubic metres per second (20 cubic feet per second) minimum flow requirement as specified in Recommendation No. 3(a) of the Interim Measures.

The National Weather Service reported that stream flows were above normal for February, but not excessive. There was little snow cover in the US portion of the basin. There were no issues for Lake Darling, however, there was the possibility of some flooding below Minot due to high water content in the soil and the resulting higher groundwater base flow. Below normal temperatures for the next three months were noted with no significant precipitation.

The National Weather Service noted that there were unusual frost depths resulting from extremely cold temperatures with little snow cover. Examples of the depth of frost were 991 millimetres (39 inches) in Towner, 1 093 millimetres (43 inches) in Bismarck and 1 346 millimetres (53 inches) in Williston. There is potential for flooding if it rains while the ground is still frozen. The National Weather Service expected the soil to be free from frost by April.

The United States Fish and Wildlife Service presented a summary of refuge operations and flows for 2013. The total provisional inflow measured at Sherwood for the period January to May 2013 was 180 876 cubic decametres (146,636 acre feet). This inflow was 176 percent of the historic record for the same period. The total provisional outflow measured at Foxholm on the south end of the Upper Souris Refuge for the first five months of 2013 was 185 930 cubic decametres (150,734 acre feet). This outflow was 213 percent of the historic record for the January-May period. Lake Darling elevation increased 0.37 metres (1.20 feet) from 486.4 metres (1,595.79 feet) on January 1 to 486.76 metres (1,596.99 feet) on May 31, 2013. On June 1, 2013, Lake Darling was at 486.65 metres (1,596.95 feet).

J. Clark Salyer National Wildlife Refuge was flooded from April through July 2013, resulting from saturated soil conditions and late heavy snow events in the Souris River Basin producing significant local runoffs in addition to releases made from dams in Saskatchewan and Lake Darling. Total outflow measured at Westhope for 2013 was 1 046 292 cubic decametres (848,230 acre feet), which was 105 192 cubic decametres (85,279 acre feet) more than the total measured inflow.

Manitoba reported that above normal precipitation in 2013 with soil moisture conditions in southern and western Manitoba above normal at the time of freeze-up in 2013. The 2013 Souris River peak flow at Wawanesa occurred during the ice breakup period. The estimated peak was 240.7 cubic metres

per second (8,500 cubic feet per second). Well above normal flow conditions continued throughout the summer with a peak of approximately 192.6 cubic metres per second (6,802 cubic feet per second) occurring in early July.

Manitoba Conservation and Water Stewardship also reported that they currently have normal snow pack conditions with snow water equivalents ranging from 50 to 80 millimetres (2.0 to 3.1 inches). Environment Canada's weather outlook for the first three months of 2014 predict near normal temperatures and precipitation throughout the basin. Current conditions show slightly above normal flood potential conditions for the main stem of the Souris River with tributaries having slightly above normal runoff potential, however actual runoff volumes and peaks are highly dependent on future weather conditions and upstream reservoir operations in both North Dakota and Saskatchewan.

The International Souris River Board members noted that it was too early to decide on the magnitude of the flood event for 2014. A conference call was set for the third week of March to review the hydrologic conditions and to assess the potential for a flood event.

John Fahlman of the Saskatchewan Water Security Agency suggested that he and Megan Estep of the United States Fish and Wildlife Service step down as co-chairs of the Hydrology Committee. Ken Bottle of the United States Fish and Wildlife Service and Rob Kirkness of the Saskatchewan Water Security Agency were approved as the co-chairs of the Hydrology Committee.

The United States Geological Survey reported that the hydrometric network was working properly with no changes planned for 2014. Environment Canada reported their hydrometric network was also working properly with two evaporation stations to be automated. Operation of Boundary Reservoir, Long Creek near Maxim and Souris River near Bechard gauging stations will be transferred from the Water Security Agency to Environment Canada after the 2014 spring runoff period.

The Saskatchewan Water Security Agency noted that there were four applications for surface water for a total of 8 cubic decametres (6.5 acre-feet). In addition there were eighteen new applications for groundwater, of which six were approved. There are a total of thirty-seven licenses approved or renewed with a total volume of 3 709 cubic decametres (3,007 acre-feet).

The North Dakota State Water Commission stated there were fifty-seven new temporary surface water permits issued in six counties for a total volume of 1 899.7 cubic decametres (1,540.1 acre-feet).

The Aquatic Ecosystem Health Committee provided an update on its activities. The Aquatic Ecosystem Health Committee has approved the "Communication Protocol for Fish Kills in the Souris River" and presented it to the International Souris River Board for them to review. They also presented a summary of the water quality monitoring program.

Environment Canada collected eight samples at Westhope and one joint sample with the United States Geological Survey at Sherwood. The data was incomplete as of February 6, 2014, however, the highlights included:

- Total Phosphorus exceeded its Water Quality Objective 0.10 mg/L for seven of the eight samples.

- *Sodium exceeded its objective of 100 mg/L for three of the samples reported.

- *Sulphate exceeded its objective of 450 mg/L in one of the eight samples.

- *Total iron exceeded its water quality objective of 300 μg/L on April 29, 2013 with a value of 682 μg/L.

- pH value of 8.51 units was observed on September 23, 2013 compared to the objective 8.5 units.

- The Dissolved Oxygen (DO) concentration was above the 5 mg/L Water Quality Objective for all samples.

- Fecal coliform exceeded its Water Quality Objective of 200 no. /100mL once with a value of 300 on June 17, 2013.

- *Chloride did not exceed the Water Quality objective of 100 mg/L.

- *Total Boron did not exceed its objective of 0.50 mg/L.

- Organics – Pesticide samples were collected in April, May, June and July; 2-4-D, Atrazine, Bromoxynil, MPCA and Picloram had positive results, but were below their respective Water Quality Objectives.

- *Indicates incomplete or provisional data, until all of the data was received

It was noted that this is the first time since 1999 that Total Phosphorus values have been below their Water Quality Objectives and that Chloride has not exceeded its Water Quality Objective since April 2010.

The Water Quality Monitoring Plan for 2014 will be the same as 2013, unless flood conditions warrant more samples to be taken.

Bruce Holliday announced that he would retire on May 20, 2014. The Board thanked him for his long-term support to the water quality program and his work with the Aquatic Ecosystem Health Committee.

The Souris River Task Force reported that both the Governor and a Senator for North Dakota have sent letters to the International Joint Commission urging them to move forward with the Plan of Study. North Dakota is prepared to provide financial assistance. The International Joint Commission reported that they had follow-up discussions with governments in mid-December 2013 and were seeking a response on funding for the Plan of Study. At this time there has been no reply from Canada or the United States. The International Joint Commission is trying to find internal funding for some of the activities identified in the Plan of Study.

A white paper was prepared in December 2013 that identified those activities the International Souris River Board could undertake in the short term. There are 15-20 tasks within the Plan of Study.

Task 7 deals with regional and reconstructed hydrology of the Souris River in support of the review of the Operating Plan. This work has been completed and the draft reviewed.

Task 1a was to review the language of the operating plan from the 1989 Agreement and to produce a white paper highlighting key elements, challenges and issues for the period 1989 to the present. The United States Army Corps of Engineers with support from the Saskatchewan Water Security Agency and United States Fish and Wildlife Service plan to prepare the white paper.

Task 1b deals with provision of recommendations on areas where changes to the language of the operating rules may be required in the present form, that is, no changes to the operating rules.

The cost would be $10,000 for Task 1a and $20,000 for Task 1b. The International Souris River Board agreed that these tasks should proceed.

The United States Geological Survey and the North Dakota State Water Commission discussed a project to develop a stochastic model for the Souris River at a cost of $280,000. The model will simulate long-term climate variability that could result in flood or drought conditions and their associated risks. The State Water Commission noted that monitoring for droughts is just as important as monitoring for floods and looks forward to seeing the results of the United States Geological Survey study.

2.2 MARCH 20, 2014 TELECONFERENCE CALL

Members in attendance were:

John-Mark Davies
Member for Canada

John Fahlman
Member for Canada

Mark Lee
Member for Canada

Nicole Armstrong
Member for Canada

Todd Sando
Member for the United States

Colonel Daniel Koprowski
Member for the United States

Gregg Wiche
Member for the United States

The Saskatchewan Water Security Agency reported on the 90-day volume estimate at Sherwood. The March forecast was 45 000 cubic decametres (36,482 acre-feet) which would result in a 50/50 sharing of water between Canada and the United States.

Runoff has occurred in the lower portion of the Souris basin in Saskatchewan although there was still snow in the upper reaches of the Souris basin. The International Souris River Board decided it was too early to determine what the 50 percent of the runoff would actually be.

The Saskatchewan Water Security Agency proposed to meet with the Flow Forecasting Liaison Committee next week and discuss the forecasted natural flow and determine North Dakota's share.

The Saskatchewan Water Security Agency also reported that Rafferty is at 549.5 metres (1802.9 feet) and had come up only 8 centimetres (3.2 inches) and would require another 40 000 cubic decametres

(32,428 acre-feet) to fill. The current release was set at 1 cubic metre per second (35.315 cubic feet per second). Boundary Reservoir is almost full and the Saskatchewan Water Security Agency is currently diverting 5 cubic metres per second (176.6 cubic feet per second) into Rafferty Reservoir. Releases from Rafferty Reservoir would be closed as the reservoir is well below its Full Supply Level.

The United States Geological Survey reported that the weather has warmed up quite rapidly in February with the ground still frozen. The North Dakota State Engineer said Lake Sakakawea was increasing half a foot each day. A similar phenomenon was also observed in southwestern Saskatchewan with rapid melting occurring.

The Flood Forecasting Liaison Committee suggested starting a release of 0.5 cubic metres per second (17.7 cubic feet per second)) and then going to 1 cubic metre per second (35.315 cubic feet per second) to meet the apportionment requirements. The runoff event is expected to be less than 1:10 event.

The Saskatchewan Water Security Agency noted that the forecast calls for cold weather with expected precipitation of 5-10 mm (0.2-0.4 inches). Manitoba Conservation and Water Stewardship said the weather is just above freezing and runoff has not begun.

The International Souris River Board agreed to declare the spring 2014 as a non-flood year (less than 1:10 event). The Flow Forecasting Liaison Committee will follow-up.

The Aquatic Ecosystem Health Committee reported that the Communications Protocol for fish kills flowchart had been revised. The United States Fish and Wildlife Service has been included in the distribution list in the revised version.

The International Souris River Board approved the revised Communications Protocol. The Aquatic Ecosystems Committee will be responsible to revise and update the Communications Protocol.

The Co-Chairs agreed to discuss the Plan of Study with the International Joint Commission.

2.3 APRIL 15, 2014, TELECONFERENCE CALL

Members in attendance were:

Russell Boals
Member for Canada

John Fahlman
Member for Canada

Mark Lee
Member for Canada

John-Mark Davies
Member for Canada

Nicole Armstrong
Member for Canada

Todd Sando
Member for the United States

Colonel Daniel Koprowski
Member for the United States

Gregg Wiche
Member for the United States

The topic of discussion was the proposed Plan of Study. The proposal was for the establishment of a Study Board to undertake the Plan of Study for the review of Annex “A” of the 1989 Agreement between Canada and the United States.

The International Souris River Board asked the International Joint Commission to the lead the discussion. The International Joint Commission provided a brief explanation of the white paper that was circulated to International Souris River Board members prior to the conference call. The International Joint Commission discussed the study board approach that they used and the composition of the proposed membership. The white paper proposes that Canada and the United States would each have three members and an additional manager from each country. The proposed time commitments are 50 percent for manager/coordinator, 25 percent for the chairs, and 15 percent for each regular member. The International Joint Commission also explained the mandate of the Study Board with examples from the Upper Great Lakes and the Lake Ontario-St. Lawrence studies. The International Joint Commission further stated the Study Board would be an independent bi-national body with membership drawn mainly from the International Souris River Board and other agencies.

The International Joint Commission also noted that they will appoint the study manager and would select the chairs and Study Board members based on the nominations they receive. It is expected more than half of the members in the Study Board would be from International Souris River Board.

The Study Board would report primarily to the International Joint Commission, however and the International Souris River Board would be kept informed.

The International Souris River Board held a short roundtable for suggestions:

- Manitoba agreed with the proposal and its approach.

- United States Army Corps of Engineers – Colonel Daniel Koprowski supports the concept of the Study Board, but was unable to commit staff at this time.

- United States Geological Survey – Is in agreement with the proposal.

- North Dakota State Engineer supports the proposed Study Board but noted that the International Souris River Board had requested active and full participation and not just an advisory role on the proposed Study Board.

The International Joint Commission said they are looking for funds internally to move the project forward. The International Joint Commission is still seeking a reference from governments. The International Souris River Board noted there was general agreement with the proposed Study Board. Further details will be included in the Directive (TOR) which are being developed by the International Joint Commission. The International Joint Commission would like to move the Plan of Study forward. The International Souris River Board Co-Chairs will have the opportunity to explain their position at the International Joint Commission appearance in Washington at the end of April.

2.3 JUNE 25, 2014, MEETING IN MINOT, NORTH DAKOTA

Members in attendance were:

Russell Boals
Member for Canada

John Fahlman
Member for Canada

Mark Lee
Member for Canada

Nicole Armstrong
Member for Canada

John-Mark Davies
Member for Canada

Todd Sando via conference call
Member for the United States

Scott Gangl
Member for the United States

Gregg Wiche
Member for the United States

Megan Estep
Member for the United States

Ken Bottle of the United States Fish and Wildlife Service and Rob Kirkness of the Saskatchewan Water Security Agency were appointed as the new co-chairs of the Hydrology Committee.

The Saskatchewan Water Security Agency reported that there was no significant runoff into Rafferty in the spring of 2014. Water from Boundary Reservoir was diverted to Rafferty Reservoir. Inflow into Alameda Reservoir was around a 1:8 runoff event. Rafferty Reservoir is still below its Full Supply Level. As a result, no releases were made from Rafferty Reservoir. The water level in Alameda Reservoir is rising. Water will have to be released to allow for 1metre (3.2 feet) of flood storage before February 1, 2015. The plan is to maintain a small flow throughout the summer and fall. The Water Security Agency will work with United States Fish and Wildlife Service regarding maintaining a live stream for as long as possible. There are no flows out of Rafferty Reservoir and Boundary Reservoir at the present moment.

The Saskatchewan Water Security Agency also reported that the fall 2013 rainfall totals were generally near normal aside from the lower part of the Souris River Basin below Rafferty and Alameda reservoirs, which received above normal precipitation. Crop land and pasture soil moisture conditions were generally adequate. Snowfall accumulations in the basin during the winter of 2013/14 were generally near normal. Snow water equivalents were generally 40-70 millimetres (1.6-2.8 inches) across the basin.

Boundary Reservoir

- The reservoir was at an elevation of 560.09 metres (1837.10 feet), or 0.74 metres (2.4 feet) below FSL prior to the start of snowmelt runoff.

- Peak snowmelt inflow of about 16 cubic metres per second (570 cubic feet per second) occurred on March 17 (about a 1:3 event).

- Following snowmelt runoff, there were seven rainfall runoff events that resulted in increased inflows to the reservoir.

- The largest rainfall runoff event occurred in early June with a peak inflow of about 8 cubic metres per second (282 cubic feet per second), about 1:8 year event.

- Approximately 75 percent of inflow volumes to date have been diverted to Rafferty Reservoir, 15 percent has been spilled into Long Creek, and 10 percent has gone to Boundary Reservoir storage.

Rafferty Reservoir

- The normal minimum February 1 drawdown target of 549.50 metres (1,802.91 feet) was achieved on January 18.

- The reservoir was drawn down to 549.45 metres (1,802.91 feet) prior to runoff to create additional storage in lieu of storage required in Boundary Reservoir.

- No further drawdown was required under the 1989 Canada-United States Agreement due to near normal runoff forecasted by the National Weather Service and Saskatchewan Water Security Agency.

- The peak snowmelt inflow of 3 cubic metres per second (110 cubic feet per second) was well below normal.

- Largest inflow into Rafferty Reservoir, with a peak of about 5 cubic metres per second (177 cubic feet per second), was from an early June rainfall event.

- About 70 percent of 2014 inflow volumes have been from Boundary Reservoir diversions.

- The reservoir is not expected to fill in 2014 without further rainfall, even without releases.

Alameda Reservoir

- The normal minimum February 1 drawdown target of 561.0 metres was achieved on January 15.

- No further drawdown was required under the 1989 Canada-United States Agreement due to a near normal runoff forecasted by the National Weather Service and the Saskatchewan Water Security Agency.

- Snowmelt runoff began in late March but was not significant until April 6.

- Peak snowmelt inflow peak of 37 cubic metres per second (1320 cubic feet per second) was approximately 1:8 year snowmelt inflow peak.

- The largest peak inflow was following the late April rainfall event with a peak inflow of approximately 40 cubic metres per second (1420 cubic feet per second).

Sherwood Crossing

- Attenuation was provided for all flood events through the operation of the Saskatchewan reservoirs, particularly the early April peak, which was reduced by about 75 percent (45 cubic metres per second to 10 cubic metres per second).

- Saskatchewan has worked with its US partners (State of ND and US FWS) to ensure downstream interests are considered in all major operating decisions and has coordinated with the NWS on forecasts.

Expected Operating Plan for Remainder of 2014

Boundary Reservoir

- As long as there is excess inflow, the Saskatchewan Water Security Agency will continue to divert inflows to Boundary Reservoir over to Rafferty Reservoir until Rafferty Reservoir reaches Full Supply Level. If and when Rafferty Reservoir fills, pass excess inflows to into Long Creek.

- Terminate diversions or passing of inflows when Boundary Reservoir is at or near its Full Supply Level and evaporative losses exceed inflows.

Rafferty Reservoir

- Maintain 0.5 cubic metres per second (18 cubic feet per second) release out of Rafferty Reservoir through the summer months and until the normal, minimum drawdown elevation of 549.5 metres (1,802.4 feet) is reached.

Alameda Reservoir

- Continue to maintain Alameda Reservoir near or slightly below Full Supply Level by approximately passing inflows.

- Once inflows to Alameda Reservoir have returned to normal summer levels, a small live outflow will be maintained throughout the summer until the normal, minimum drawdown elevation of 561.0 metres (1,840.1 feet) is reached.

The United States Geological Survey provided a summary of 2014 flow conditions for the United States portion of the Souris Basin. The total volume of flow past the Long Creek at Noonan gage through May 31, 2014 calendar year was 18 633 cubic decametres (15,106 acre-feet). This volume is about 1% greater than the median flow for the last 54 years. Flows for the current year are in the near normal to above normal range. The peak discharge for the period January 1 to May 31, 2014 is 6.2 cubic metres per second (219 cubic feet per second), which ranks 42 out of 55 years of record.

The United States Geological Survey also reported that the total volume of flow past the Souris River near Sherwood gage through May 31, 2014 calendar year was 103 055 cubic decametres (83,547 acre-feet). This May 31, 2014 calendar's year's total flow is approximately 74 percent greater than the median flow for the last 83 years. Flows for the current year, based on the last 83 years of data are in the normal to much above normal range. The peak discharge for the period January 1 to May 31 was 36 cubic metres per second (1,270 cubic feet per second), which ranks 37 out of 83 years of record.

Flows recorded at the Souris River near Westhope gage exceeded the long-term mean for most of the period. The minimum discharge for the period January 1 to May 31 was 0.9 cubic metres per second (32 cubic feet per second) from February 6-7. The peak discharge for the period January 1 to May 31 was 72 cubic metres per second (2,550 cubic feet per second) on May 25 and ranks 23 out of 84 years of record.

The North Dakota State Water Commission and the United States Geological Survey low-flow monitoring program on the Souris River main stem in the vicinity of the Eaton Irrigation Project near Towner, North Dakota, was discontinued in Spring 2014.

The United States Geological Survey also reported that there was good agreement between the joint measurements taken by them and Environment Canada. The difference in measurements at the Sherwood Crossing was 2 percent, at Noonan 6 percent (windy day). The difference in measurements at Short Creek near Roche Percee was 11 percent (wading); and Long Creek at Western Crossing was 4.8 percent, respectively.

The National Weather Service noted that it was a modest runoff year. There was significant runoff from a relatively low snowpack. The frost depth was around 6 feet, which led to freezing of waterlines. December 2013 had many days below 14 degrees Fahrenheit, which is below normal. The winter was remarkably cold and caused long and extended runoff. A number of flood warnings were issued, but nothing major happened. Therefore, there was discussion with local people (Towner, Bantry) to explain the flood situation and how flood warnings are issued.

The Saskatchewan Water Security Agency noted that as a result of the continuous wet periods in Saskatchewan, wetlands were filled with water and the soils have become saturated in areas above Alameda.

The National Weather Service provided both the short and long-term climatic outlook for the southern Souris River Basin. The National Weather Service noted that an El-Nino was expected before next winter (roughly 80 percent probability), which may result in a warmer December.

Manitoba Conservation and Water Stewardship reported the Manitoba portion of the basin has received between 100-150 millimetres (4 to 6 inches) of precipitation since May 1, which is 110-150 percent of normal for the area.

The 2014 spring runoff on the Manitoba tributaries began the last week of March. Tributaries had multiple peaks in response to the snowmelt and rainfall events. Tributaries peaked in early May with a flood peak of about 1:5 year events. The flood outlook for March for the tributaries was normal to slightly above normal flood potential.

The Souris River peaked at the North Dakota-Manitoba border at approximately 70 cubic metres per second (2,470 cubic feet per second) on May 20. The flows coming into Manitoba have been greater than normal throughout the spring and early summer.

The Souris River had two significant peaks at Wawanesa on April 10 and May 10, respectively. The peak on April 10 was generated from local runoff and was very sharp with an approximate value of 178 cubic metres per second (6, 286 cubic feet per second). The second peak of 152 cubic metres per second (5,368 cfs) was a combination of water entering Manitoba from the main stem and the early May peaks of local tributaries. The two peaks were characterized as 1:5 year events. Flows at

Wawanesa have remained well above normal, but are slowly receding back to a normal range. At present, the flow at Wawanesa is 92 cubic metres per second (3, 249 cfs). The normal flow in June is between 15 to 30 cubic metres per second (530 to 1,060 cubic feet per second).

On-farm water supplies are adequate as there was sufficient runoff to fill dugouts. Groundwater aquifers also have good supply levels. Since flows on the tributaries and the main stem of the Souris are above normal, there are no water supply concerns at the present time.

The United States Fish and Wildlife Service presented a summary of refuge operations and flows for the period January 1 to May 31, 2014. The United States Fish and Wildlife Service operates three national wildlife refuges within the United States portion of the Souris River Basin which include:

- Upper Souris National Wildlife Refuge near Foxholm, North Dakota, upstream of the City of Minot,

- J. Clark Salyer National Wildlife Refuge located near Upham, North Dakota, downstream of the City of Towner, and

- Des Lacs National Wildlife Refuge on the Des Lacs River (a tributary of the Souris River) near Kenmare, North Dakota.

Upper Souris National Wildlife Refuge - The total provisional inflow measured at Sherwood for the first five months of the year was 101 231 cubic decametres (82,068 acre-feet). This inflow was 98 percent of the historic January-May inflow, which was 103 005 cubic decametres (83, 506 acre-feet) for the period from 1938 through 2014. The total Upper Souris Refuge pool volume increased an estimated 8 263 cubic decametres (6,699 ac-ft) during the first five months. The provisional outflow measured at Foxholm on the south end of the Upper Souris Refuge for the first five months of 2014 was 100 913 cubic decametres (81,810 acre-feet). This outflow was 115 percent of the historic record for the January-May outflow, which was 87 502 cubic decametres (70,938 acre-feet) for the period 1938 to 2014. Lake Darling elevation increased 0.21 metres (0.70 feet) from 486.49 metres (1596.09 feet) on January 1 to 486.70 metres (1596.79 feet) on May 31, 2014. Lake Darling was at 486.70 metres (1596.79 feet) on June 1 2014.

J. Clark Salyer National Wildlife Refuge - The total provisional flow measured from the Souris River to the J. Clark Salyer Refuge from January 1 through May 31 was 209 607 cubic decametres (169, 929 acre-feet). This was 159 percent of the historic January-May inflow, which was 131 745 cubic decametres (106,806 acre-feet) for the period 1938-2014. Pool volume on May 31 was 78 773 cubic decametres (63,861 acre-feet). This was 42 365 cubic decametres (34,345 acre-feet) above the January 1 volume. Approximately 289 037 cubic decametres (234,323 acre-feet) were passed to Manitoba during the five month period.

The Flow Forecasting Liaison Committee reported that the Committee was active in May. Communications worked well with the United States Fish and Wildlife Service after the spring freshet. The Committee had its last communication on May 27.

The Aquatic Ecosystem Health Committee provided an update on its Terms of Reference. The International Souris River Board approved the Terms of Reference.

Kristina Farmer from Environment Canada was approved as the new Canadian Co-Chair of the Aquatic Ecosystem Health Committee replacing Bruce Holliday.

The Aquatic Ecosystem Health Committee prepared a draft document to support adding E. coli to the Water Quality Objectives. Because numeric standards vary slightly by jurisdiction, the Aquatic Ecosystem Health Committee met and decided on the appropriate numeric value. That number is being circulated throughout the representative agencies for comment and will be presented to the International Souris River Board when a consensus is reached.

The Aquatic Ecosystem Health Committee has begun a review of the existing Water Quality Objectives. The Aquatic Ecosystem Health Committee plans to submit a proposal for funds under the International Watershed Initiative for a literature review of current objectives for all uses, including aquatic life and human health, and an assessment of appropriateness of each objective for the Souris River.

The Aquatic Ecosystem Health Committee presented a summary of the water quality monitoring program at Westhope. A total of nine samples were collected by Environment Canada in 2013; eight samples were collected at Westhope and one joint sample was collected with the USGS at Sherwood.

- Total Phosphorus exceeded its Water Quality Objective 0.10 mg/L for 7 of the 8 samples collected in 2013.

- Sodium exceeded its objective of 100 mg/L for 4 of the 8 samples reported to date

- Sulphate exceeded its objective of 450 mg/L in one of the eight samples collected in 2013.

- Total Dissolved Solids exceeded the Water Quality Objective of 1000 mg/L for 2 of the 8 samples collected in 2013.

- Total iron exceeded its water quality objective of 300 μg/L on April 29, 2013 with a value of 682 μg/L.

- pH exceeded its Water Quality objective of 8.5 units in 2 of the 8 samples collected in 2013.

- The Dissolved Oxygen (DO) concentration was above the 5 mg/L Water Quality Objective for all samples in 2013.

- Fecal coliform exceeded its Water Quality Objective of 200 no. /100mL once in 2013 with a value of 300 on June 17, 2013. This was the first exceedance since 2010.

- Chloride did not exceed the Water Quality objective of 100 mg/L in 2013, and

- Total Boron did not exceed its objective of 0.50 mg/L in 2013.

Organics – Pesticide samples were collected in April, May, June and July of 2013. Similar to 2012, 2,4D, Atrazine, Bromoxynil, MPCA, and Picloram had positive results, but were below their respective Water Quality Objectives.

Most of the median values of the parameters in 2013 are lower than those in 2012. The exceptions are Nitrate, Phosphorus, Boron, Molybdenum, Selenium, and Atrazine. The Dissolved Oxygen was higher in 2013, which is a good sign. The flow at Westhope appeared to be higher than normal for most of the year. This may be partially responsible for the drop in median values compared to 2012. The 2013 year is the first time since 1999 that a Total Phosphorus value has been below the Water Quality Objectives of 0.10 mg/L. Since April 2010, Chloride has not exceeded the Water Quality Objectives of 50 mg/L.

The Aquatic Ecosystem Health Committee also presented a summary of the water quality monitoring program at Sherwood. The USGS collected a total of eight water quality samples from the Souris River in 2013 at the Sherwood site. The following is a summary of the monitoring program:

- Total Phosphorus exceeded the Water Quality Objective of 0.10 mg/L for 8 of the 8 samples (100%) collected in 2013, though the median value is down from 2012. The Total Phosphorus values ranged from 0.15 mg/L on October 30 to 0.33 mg/L on August 26 at Sherwood.

- Sodium exceeded the Water Quality Objective of 100 mg/L for 4 of the 8 samples (50%) in 2013. This was down from an 83% exceedance in 2012. The results ranged from 69.5 mg/L on July 8 to 154 mg/L on October 30.

- Total Iron exceeded the Water Quality Objective of 300 μg/L in all 8 samples in 2013, with only one value measuring below 1000 μg/L (January 3). The maximum value was 3010 on June 12 with the median of values for 2013 being 1860 μg/L.

- Sulfate met the Water Quality Objective of 450 mg/L on all occasions in 2013. The minimum sulfate value in 2013 was recorded July 8 with a value of 192 and a maximum value recorded on May 22 with a value of 381. There has only been one exceedance of the sulfate standard in the last five years, and the values remain fairly consistent in the 300's throughout the year.

- Total Dissolved Solids met the Water Quality Objective of 1000 mg/L in all samples collected in 2013.

- pH met the Water Quality Objective of 8.5 on all occasions in 2013.

- Dissolved Oxygen concentrations remained well above the 5 mg/L Water Quality Objective in 2013. Concentrations ranged from 7.3 mg/L on June 12 to 12.4 mg/L on October 30.

- Chloride met the Water Quality Objective of 100 mg/L in 2013.

- Total Boron met the Water Quality Objective of 0.50 mg/L in 2013.

Organics

- Pesticide samples at the Sherwood site were collected as a part of an intensive statewide study conducted by the ND Department of Agriculture. Samples were collected at Sherwood in April, May, June, July, August, and October.

- 98 Pesticides were tested for and none were above the Water Quality Objectives, or for those not part of routine testing, none were above either aquatic life benchmarks or human health limits.

- Of the pesticides for which Water Quality Objectives are established, 2, 4-D, Atrazine, Bromoxynil, Dicamba, MPCA, and Picloram had positive, though very low results.

Only three parameters, total phosphorus, sodium, and iron were above their Water Quality Objectives in 2013. Most of the median values were lower than last year, except for sulfate, iron, molybdenum, and total suspended solids. It is likely that the above normal flows of 2013, along with the flushing that occurred during the flood of 2011, are partially accountable for the improved water quality in 2013.

Dissolved oxygen was greater than the objective of 5 mg/L throughout the year, which resulted in no winter fish kills. It is believed that the continual flow throughout the winter played a role in this positive outcome.

The International Souris River Board discussed a number of issues and concerns in having the International Souris River Board designated as an International Watershed Initiative Board. The concerns were regarding nominations and public representation on the International Souris River Board. The International Souris River Board Co-Chairs were tasked to work with the International Souris River Board secretaries to identify stakeholders/citizens representing major stakeholders in the basin. Nominees from these stakeholders would be considered as candidates to serve as members of the Board.

The City of Minot said the Northwest Area Water Supply Supplemental Draft Environmental Impact Statement has been completed by the United States Bureau of Reclamation. The Supplemental Draft Environmental Impact Statement is expected to address Canada and Manitoba's concerns expressed in the initial Environmental Impact Statement that led to the court case. The Supplemental Draft Environmental Impact Statement was expected to be released June 22-27 for public comment. On August 11, 2014, there will be an open house in Minot for public input. The report is expected to be sent to the judge in the fall of 2014.

The International Joint Commission reported there was no response from governments on the status of the Plan of Study. The International Souris River Board members expressed their desire to move forward with the Plan of Study. While waiting for government's approval, some work could done under the current Agreement such as:

- Clearing up the language of the Agreement,

- Developing reservoir regulation manuals, and

- Include summer rainfall events that have become more problematic in recent years.

Manitoba Conservation and Water Stewardship suggested agencies work together on the activities listed above and bring them back to the International Souris River Board. As a first step, the four agencies (US ACE, WSA, US FWS, and ND SWC) need to meet and work towards the Plan of Study. The International Souris River Board was in agreement with this approach. The Plan of Study will be kept on the International Souris River Board's future agenda.

2.4 SEPTEMBER 25, 2014, TELECONFERENCE CALL

Members in attendance were:

Russell Boals
Member for Canada

Mark Lee
Member for Canada

John Fahlman
Member for Canada

John-Mark Davies
Member for Canada

Todd Sando
Member for the United States

Gregg Wiche
Member for the United States

Megan Estep
Member for the United States

Colonel Daniel Koprowski
Member for the United States

Scott Gangl
Member for the United States

Water Survey of Canada presented the natural flow computations for the periods ending on May 31 and August 31, 2014. For the period ending on May 31, 2014, the total diversion in the Souris River Basin was 36 589 cubic decametres (29,663 acre-feet). The recorded flow at Sherwood was 103 055 cubic decametres (83,547 acre-feet). The natural flow at Sherwood was 136 205 cubic decametres (110,421 acre-feet), which was greater than the 50 000 cubic decametres (40,535 acre-feet) criteria and therefore the apportionment for 2014 would be 60/40. The United States received 104 786 cubic decametres (84,950 acre-feet), which resulted in a surplus of 50 086 cubic decametres (40,783 acre-feet).

Water Survey of Canada also presented the computed natural flow for the period ending August 31, 2014. The total diversion in the Souris River Basin was 50 932 cubic decametres (41,291 acre-feet). The recorded flow at Sherwood was 201 501 cubic decametres (163,357 acre-feet), and the natural flow at Sherwood was 242 921 cubic decametres (196,936 acre-feet). The United States share at 40 percent is 97 170 cubic decametres (78,776 acre-feet). The United States received 203 387 cubic decametres (164,886 acre-feet), which was a surplus of 106 217 cubic decametres (86,110 acre-feet). Both the May 31 and August 31, 2014 periods ended with surplus deliveries to the United States.

Water Survey of Canada reported that Long Creek had a net gain in the United States portion of the basin of 6 128 cubic decametres (4,968 acre-feet) and 15 234 cubic decametres (12,350 acre-feet) for May 31 and August 31, 2014, respectively.

The natural flow was well above the median.

The Saskatchewan Water Security Agency gave a brief update on the Core Committee's work with regards to the 1989 Canada-United Agreement. A conference call was held on July 9, 2014 between Saskatchewan Water Security Agency, United States Fish and Wildlife Service, United States Geological Survey, and United States Army Corps of Engineers. The three major topics discussed were:

- Digitizing the current Annex A and having it ready for editing in MS Word. The US FWS has completed the digital conversion,

- Reviewing the language in Annex A and by extension this involves the entire 1989 Canada-United States Agreement, and

- Developing a reservoir regulation manual.

The Core Committee held a follow-up call on August 7 and assigned each agency was asked to compile a list of concerns. The Parties had agreed to finish this task by the end of August. The Saskatchewan Water Security Agency noted that the next step is to have a face-to-face meeting, which is planned for October 7-8, 2014 in St. Paul, Minnesota. The Core Committee plans to move forward on the language issues in the 1989 Canada-United States Agreement- Annex A and Annex B and work toward developing reservoir regulation manuals as a primary task. They will also review the regional hydrology and hydro-meteorological network. The Core Committee will prepare a draft plan to guide the work.

3.0 MONITORING

3.1 INSPECTIONS OF THE BASIN

During the year, the staff of the Water Survey Division of Environment Canada, Saskatchewan Watershed Authority, the North Dakota State Water Commission, Manitoba Water Stewardship, and the United States Geological Survey carried out frequent field inspections of the Souris River basin.

3.2 GAUGING STATIONS

A list of the gauging stations being operated in the Souris River basin is given in Table 1. In addition, the United States Geological Survey operated three miscellaneous stream flow-measurement sites in the vicinity of the Eaton Irrigation Project near Towner, North Dakota.

The station numbers and the locations of the hydrometric stations measuring streamflow are shown in Part I of Table 1. The gauging station numbers and the locations of the hydrometric stations located on lakes and reservoirs in the basin are shown in Part II of Table 1.

Table 1.
STREAMFLOW, WATER-LEVEL, AND WATER QUALITY STATIONS
IN THE SOURIS RIVER BASIN
Part I--Streamflow

Index Number	Stream	Location	State or Province	Operated By
05NA003	Long Creek[1]	at Western Crossing	Saskatchewan	Environment Canada
(05113360)				
05NA004	Long Creek	near Maxim	Saskatchewan	Saskatchewan Watershed Authority
05NA005	Gibson Creek	near Radville	Saskatchewan	Environment Canada
05NB001	Long Creek	near Estevan	Saskatchewan	Environment Canada
05NB011	Yellowgrass Ditch	near Yellowgrass	Saskatchewan	Environment Canada
05NB014	Jewel Creek	near Goodwater	Saskatchewan	Environment Canada
05NB017	Souris River	near Halbrite	Saskatchewan	Environment Canada
05NB018	Tatagwa Lake Drain	near Weyburn	Saskatchewan	Environment Canada
05NB021	Short Creek[1]	near Roche Percee	Saskatchewan	Environment Canada
(05113800)				
05NB031	Souris River	near Bechard[2]	Saskatchewan	Saskatchewan Watershed Authority
05NB033	Moseley Creek	near Halbrite	Saskatchewan	Environment Canada
05NB034	Roughbark Creek	near Goodwater	Saskatchewan	Environment Canada
05NB035	Cooke Creek	near Goodwater	Saskatchewan	Environment Canada
05NB036	Souris River	below Rafferty Reservoir	Saskatchewan	Environment Canada
05NB038	Boundary Reservoir Diversion Canal	near Estevan	Saskatchewan	Environment Canada
05NB039	Tributary	near Outram	Saskatchewan	Environment Canada

Index Number	Stream	Location	State or Province	Operated By
05NB040	Souris River	near Ralph	Saskatchewan	Environment Canada
05NB041	Roughbark Creek	above Rafferty Reservoir	Saskatchewan	Environment Canada
05NC001	Moose Mountain Creek	below Moose Mountain Lake	Saskatchewan	Saskatchewan Watershed Authority
05ND004	Moose Mountain Creek	near Oxbow	Saskatchewan	Environment Canada
05ND010	Moose Mountain Creek	above Alameda Reservoir	Saskatchewan	Environment Canada
05ND011	Shepherd Creek	near Alameda	Saskatchewan	Environment Canada
05NE003	Pipestone Creek	above Moosomin Reservoir	Saskatchewan	Environment Canada
05NF001	Souris River	at Melita	Manitoba	Environment Canada
05NF002	Antler River	near Melita	Manitoba	Environment Canada
05NF006	Lightning Creek	near Carnduff	Saskatchewan	Environment Canada
05NF007	Gainsborough Creek	near Lyleton	Manitoba	Environment Canada
05NF008	Graham Creek	near Melita	Manitoba	Environment Canada
05NF010	Antler River	near Wauchope	Saskatchewan	Environment Canada
05NG001	Souris River	at Wawanesa	Manitoba	Environment Canada
05NG003	Pipestone Creek	near Pipestone	Manitoba	Environment Canada
05NG007	Plum Creek	near Souris	Manitoba	Environment Canada
05NG012	Elgin Creek	near Souris	Manitoba	Environment Canada
05NG020	Medora Creek	near Napinka	Manitoba	Environment Canada
05NG021	Souris River	at Souris	Manitoba	Environment Canada
05NG024	Pipestone Creek	near Sask. Boundary	Manitoba	Environment Canada
05113520	Long Creek Tributary	near Crosby	North Dakota	U.S. Geological Survey
05113600	Long Creek[1 3]	near Noonan	North Dakota	U.S. Geological Survey
(05NB027)				
05114000	Souris River[1 3]	near Sherwood	North Dakota	U.S. Geological Survey
(05ND007)				
05116000	Souris River[3]	near Foxholm	North Dakota	U.S. Geological Survey
05116135	Tasker Coulee Tributary	near Kenaston	North Dakota	U.S. Geological Survey
05116500	Des Lacs River[3]	at Foxholm	North Dakota	U.S. Geological Survey
05117500	Souris River[3]	above Minot	North Dakota	U.S. Geological Survey
05119410	Bonnes Coulee	near Velva	North Dakota	U.S. Geological Survey
05120000	Souris River[3]	near Verendrye	North Dakota	U.S. Geological Survey
05120180	Wintering River Tributary	near Kongsberg	North Dakota	U.S. Geological Survey
05120500	Wintering River[3]	near Karlsruhe	North Dakota	U.S. Geological Survey
05122000	Souris River[3]	near Bantry	North Dakota	U.S. Geological Survey
05123300	Oak Creek Tributary	near Bottineau	North Dakota	U.S. Geological Survey
05123400	Willow Creek[3]	near Willow City	North Dakota	U.S. Geological Survey
05123510	Deep River[3]	near Upham	North Dakota	U.S. Geological Survey
05124000	Souris River[1 3]	near Westhope	North Dakota	U.S. Geological Survey
(05NF012)				

Table 1.
STREAMFLOW, WATER-LEVEL, AND WATER QUALITY STATIONS
IN THE SOURIS RIVER BASIN
Part II--Water Level

Index Number	Stream	Location	State or Province	Operated By
05113750	East Branch Short Creek Reservoir	near Columbus	North Dakota	U.S. Geological Survey
05115500	Lake Darling	near Foxholm	North Dakota	U.S. Geological Survey
LGNN8	Souris River	at Logan	North Dakota	U.S. Corps of Engineers
				U.S. N. Weather Service
SWRN8	Souris River	at Sawyer	North Dakota	U.S. Corps of Engineers
				U.S. N. Weather Service
TOWN8	Souris River	at Towner	North Dakota	U.S. Corps of Engineers
				U.S. N. Weather Service
VLVN8	Souris River	at Velva	North Dakota	U.S. Corps of Engineers
				U.S. N. Weather Service
	Upper Souris Refuge	Dams 87 and 96	North Dakota	U.S. Fish and Wildlife
	Des Lacs Refuge	Units 1 - 8 inclusive	North Dakota	U.S. Fish and Wildlife
	J. Clark Salyer Refuge	Dams 320, 326, 332, 341, and 357	North Dakota	U.S. Fish and Wildlife
05NA006	Larsen Reservoir	near Radville	Saskatchewan	Environment Canada
05NB012	Boundary Reservoir	near Estevan	Saskatchewan	Saskatchewan Watershed Authority
05NB016	Roughbark Reservoir	near Weyburn	Saskatchewan	Environment Canada
05NB020	Nickle Lake	near Weyburn	Saskatchewan	Environment Canada
05NB032	Rafferty Reservoir	near Estevan	Saskatchewan	Environment Canada
05NC002	Moose Mountain Lake	near Corning	Saskatchewan	Environment Canada
05ND008	White Bear (Carlyle) Lake	near Carlyle	Saskatchewan	Saskatchewan Watershed Authority
05ND009	Kenosee Lake	near Carlyle	Saskatchewan	Saskatchewan Watershed Authority
05ND012	Alameda Reservoir	near Alameda	Saskatchewan	Environment Canada
05NE002	Moosomin Lake	near Moosomin	Saskatchewan	Environment Canada
05NF804	Metigoshe Lake	near Metigoshe	Manitoba	Manitoba Water Stewardship
05NF805	Sharpe Lake	near Deloraine	Manitoba	Manitoba Water Stewardship
05NG023	Whitewater Lake	near Boissevain	Manitoba	Environment Canada
05NG801	Plum Lake	above Deleau Dam	Manitoba	Manitoba Water Stewardship
05NG803	Elgin Reservoir	near Elgin	Manitoba	Manitoba Water Stewardship
05NG806	Souris River	above Hartney Dam	Manitoba	Manitoba Water Stewardship

Index Number	Stream	Location	State or Province	Operated By
05NG807	Souris River	above Napinka Dam	Manitoba	Manitoba Water Stewardship
05NG809	Plum Lake	near Findlay	Manitoba	Manitoba Water Stewardship
05NG813	Oak Lake	at Oak Lake Resort	Manitoba	Manitoba Water Stewardship
05NG814	Deloraine Reservoir	near Deloraine	Manitoba	Manitoba Water tewardship

Table 1.
STREAMFLOW, WATER-LEVEL, AND WATER QUALITY STATIONS
IN THE SOURIS RIVER BASIN
Part III--Water Quality

Index Number	Stream	Location	State or Province	Operated By
05114000	Souris River[1 3]	near Sherwood	North Dakota	U.S. Geological Survey
(05ND007)				
05115500	Lake Darling	near Foxholm	North Dakota	U.S. Geological Survey
05116000	Souris River[3]	near Foxholm	North Dakota	U.S. Geological Survey
05116500	Des Lacs River[3]	at Foxholm	North Dakota	U.S. Geological Survey/
(380021)				N.D. Dept. of Health
05117500	Souris River[3]	above Minot	North Dakota	U.S. Geological Survey/
(380161)				N.D. Dept. of Health
05120000	Souris River[3]	near Verendrye	North Dakota	U.S. Geological Survey/
(380095)				N.D. Dept. of Health
05122000	Souris River[3]	near Bantry	North Dakota	U.S. Geological Survey
05123400	Willow Creek[3]	near Willow City	North Dakota	U.S. Geological Survey
05123510	Deep River[3]	near Upham	North Dakota	U.S. Geological Survey
	J. Clark Salyer Refuge	Pool 357	North Dakota	U.S. Fish and Wildlife
05124000	Souris River[1 3]	near Westhope (QA)	North Dakota	U.S. Geological Survey
(05NF012)				

[1] International gauging station

[2] Formerly published as Souris River below Lewvan

[3] Operated jointly for hydrometric and water-quality monitoring

4.0 TRANSBOUNDARY WATER QUALITY OBJECTIVES AND MONITORING

The water quality of the Souris River at the International Boundary has been monitored by the International Souris River Board (formally the Souris River Bilateral Water Quality Monitoring Group) since 1990. The two sites are located at the Saskatchewan/North Dakota border near Sherwood, ND, and at the North Dakota/Manitoba border near Westhope, ND.

The Aquatic Health Ecosystem Committee conducted one meeting (June) and two conference calls (March and May), along with numerous e-mail correspondence in 2014. The Committee discussed wording for the E. coli support document, how best to review water quality objectives, Terms of Reference Review, updates to the Communications Protocols for spills and fish kills in the Souris River, improvements to the ISRB website, and outstanding action items. The Committee also discussed improving data sharing with SharePoint.

4.1 OVERVIEW OF WATER QUALITY

Water quality objectives are established for the two border crossings. When water quality objectives are not achieved, such conditions are referred to as "exceedances." A summary of water quality exceedances for 2014 along with historical data is reported in Appendix E.

Historically, the principal concerns regarding water quality in the Souris River basin have been related to high total dissolved solids (TDS), depleted dissolved oxygen, and high levels of nutrients, especially phosphorus. High TDS increases the hardness of water and can cause scale build up in pipes and filters. It is also detrimental to aquatic life, especially spawning fish and juveniles as it reduces water clarity. Low dissolved oxygen levels, or anoxia, can suffocate fish and other aquatic life and cause fish kills as well as mobilize trace metals. High nutrient levels like phosphorus can cause algae blooms which lead to reductions in dissolved oxygen. It can also aid in the formation of blue-green algae which can produce toxins that are harmful to humans and animals.

In 2014, concentrations of most of the historical constituents of concern showed improvement. TDS met water quality in all samples at the Sherwood station and only exceeded the water quality objective two out of six times at the Westhope station. Dissolved oxygen concentrations were well above the objective at both sites throughout the sampling year. Total phosphorous was the only constituent that did not show improvement as it exceeded the water quality objective in 100 percent of the samples taken from each station.

At the Saskatchewan/North Dakota border crossing in Sherwood, the United States Geological Survey conducted sampling eight times in 2014. Environment Canada conducted eight samples at the North Dakota/Manitoba border crossing. At the North Dakota/Manitoba border crossing in Westhope, the United States Geological Survey conducted one sample in 2014 simultaneously with Environment Canada to compare sampling methods.

At the Saskatchewan/North Dakota boundary, exceedances of specific water quality objectives included total phosphorus, sodium, and total iron. While the phosphorus results had 100 percent exceedance of the water quality objective, the median value was down from 2012, and 2013. Sodium exceeded the water quality objective for 37.5 percent of the samples, which is down from 83 percent in 2012 and 50 percent in 2013. Both the maximum and minimum values for total iron were up however, with 100 percent exceedance of the 300 micrograms per liter objective, with only two samples measuring below 1,000 micrograms per liter. The maximum value was 3,230 micrograms per liter.

While dissolved oxygen has historically been a constituent of concern, this year it was again above the water quality objective for all samples, ranging from 8.0 milligrams per liter to 12.9 milligrams per liter. A concentration of less than 5.0 milligrams per liter is considered an exceedance. pH also met the water quality objective for all samples in 2014.

Pesticide samples were also collected as a part of an intensive statewide study conducted by the North Dakota Department of Agriculture. Ninty-eight pesticides were tested for and none were above the water quality objectives, or for those not part of routine testing, none were above either aquatic life benchmarks of human health limits. Three pesticides, (2,4-D, Atrazine, and MPCA) had positive, though very low results.

Environment Canada collected a total of eight water quality samples from the Souris River at Westhope in 2014. Exceedances of specific water quality objectives included total phosphorus, sodium, sulphate, total dissolved solids, total iron, pH and E. coli. Total phosphorus exceeded the water quality objective in 100 percent of the samples analyzed. Sodium exceeded the water quality objective in 63 percent of the samples and total dissolved solids exceeded the water quality objective in 43 percent of the samples. Sulphate exceeded the water quality objective in 29 percent of the samples, on two sampling occasions under ice conditions. The total iron objective was exceeded one time and pH exceeded the objective once in 2014. E. coli exceeded the 200 colonies per 100 milliliters objective once with a value of 2800 colonies per 100 milliliters.

Pesticide samples were collected three times in 2014. Similar to previous years, 2,4-D, MPCA, and Picloram had positive results but were well below their respective water quality objectives.

4.2 CHANGES TO POLLUTION SOURCES IN 2014

The growth of the oil and gas industry in the Saskatchewan/North Dakota region of the Souris River basin continued in 2014. However, by the end of 2014, decreasing oil prices limited the number of new wells being constructed and most of the production moved south towards the more cost effective portion of the Bakken.

Oil development and production has the potential of increasing storm water pollution through increases in erosion and can cause a variety of water quality impairments. However, the most prevalent source of pollution is still nonpoint source pollution from agriculture.

The Souris River basin typically experiences short duration but intense precipitation during the spring and early summer months. These storms can cause overland flooding and rising river levels. Cropping practices that don’t use soil and water conservation methods and livestock grazing near and watering in the river are the likely sources of excessive nutrient, sediment, and E. coli bacteria concentrations, along with laying the groundwork for dissolved oxygen depletion. However, this has been lessened in recent years by the installation of animal waste systems and Best Management Practices on agricultural land through a variety of watershed improvement projects throughout the basin on both sides of the border.

Dams frequently have a substantial additive affect on phosphorus loading. Large reservoirs with hypolimnetic releases generally contribute high phosphorus loads. Low head dams can contribute also as they are often loaded with nutrient rich prairie soils. The reservoirs and dams often become anoxic during the winter, releasing additional phosphorus from bottom sediments. Downstream loading at the border has historically been very high, because spring runoff occurs prior to ice out, thereby purging

many of the shallow, nutrient rich ponds. The continual release of water throughout the year from the large upstream reservoirs seems to have lessened this effect.

Point sources pollution from the cities of Estevan and Minot have been reduced by advanced wastewater treatment. Smaller cities continue to discharge effluent intermittently. All wastewater treatment lagoons in North Dakota are required in their permit to meet the State's water quality standards at the point of discharge. These standards are protective of the objectives set up by the International Souris River Board.

Future impacts to water quality and aquatic ecosystem health included changing agriculture and landscape, urban development, energy development, and water appropriations that reduce flows.

4.3 CHANGES TO MONITORING

There are no changes to the monitoring plan for 2015. The 2015 monitoring plan can be found in Appendix F.

4.4 WINTER ANOXIA

Winter anoxia and fish kills as the result of very low concentrations of dissolved oxygen has been documented in the Souris River basin on many occasions. Factors contributing to low oxygen levels have not been definitively determined, but are thought to be increased sediment oxygen demand (as determined in North Dakota's 2010 Total Maximum Daily Load report on the reach of the Souris River from Sherwood to Lake Darling), macrophyte decomposition, organic enrichment, photosynthesis suppression, low flow, scouring of low head dams during high flow events, and low level draw downs from reservoirs.

Dissolved oxygen concentrations at both monitoring stations met the water quality objective of 5.0 milligrams per liter for all samples throughout 2014. This was the third consecutive year of meeting the objective. To better determine the minimum flow needed to protect these levels, the Board agreed to keep a watch on dissolved oxygen conditions and the USGS and Environment Canada will attempt to collect dissolved oxygen and ammonia samples if low flow conditions prevail during future winters.

5.0 WATER-DEVELOPMENT ACTIVITIES IN 2014

5.1 NORTHWEST AREA WATER SUPPLY PROJECT

The Garrison Diversion Municipal, Rural, and Industrial (MRI) water-supply program, passed by the United States Congress on May 12, 1986, as part of the Garrison Diversion Reformation Act of 1986, authorized the appropriation of federal funds for the planning and construction of water-supply facilities throughout North Dakota. An agreement between the North Dakota State Water Commission and the Garrison Conservancy District in 1986 provided a method through which the agencies can request funding for MRI water-system projects from the Secretary of the Interior. On the basis of this agreement, the Northwest Area Water Supply (NAWS) study was initiated in November 1987.

The NAWS project has been designed to supply a reliable source of treated water to cities, communities, and rural water systems in 10 counties in northwestern North Dakota. The project has an estimated cost of $217 million.

The water supply for the project is Lake Sakakawea, located in the Missouri River system. The annual use authorized under the State of North Dakota water permit is 18 502 dam3 (15,000 acre-feet).

Canada is concerned that the NAWS project could permit the interbasin transfer of non-native biota. NAWS would be the first project to divert water across the continental divide to the Hudson Bay drainage basin.

The Province of Manitoba filed suit in U.S. District Court. The court required the project undergo further NEPA review, and placed an injunction on the project.

On April 15, 2005, the Court modified the injunction to allow the construction on the pipeline between Lake Sakakawea and Minot to continue.

On March 24, 2006, the Court modified the injunction to allow additional construction of the Minot High Service Pump Station, the pipeline from the High Service Pump Station to the northern part of the City of Minot, and the pipeline to Berthold to proceed. It was determined that this construction would not affect treatment decisions. Design work on these projects was completed in 2006 and contract awards were made in 2007 and 2008. All 45 miles of this pipeline were completed by the summer of 2008. Berthold started receiving water in August 2008. The High Service Pump Station started operating in December 2009.

On March 18, 2008, the Court again modified the injunction to allow additional design and construction activities for the entire Northern Tier for features not affecting treatment decisions. The Kenmare-Upper Souris project started serving water in December 2009. The NAWS-All Seasons-Upham pipeline started serving water in September 2009. The Mohall-Sherwood-All Seasons pipeline has planned completion in Spring 2012. The Minot Air Force Base pipeline and the Upper Souris-Glenburn segment north of the Air Force Base have planned completion in 2012. Berthold, the Kenmare-Upper Souris project, and the NAWS-All Seasons-Upham pipeline are currently receiving limited water supply from the Minot and Sundre aquifers.

The construction activity in 2012 revolved around three contracts that were delayed by the flooding in 2011. Two are pipeline contracts connecting Minot's North Hill, the Minot Air Force Base, Glenburn, Upper Souris Water Users System II water treatment facility three miles north of Glenburn, and two connections for the North Prairie Rural Water System to the NAWS project. These projects were completed.

The other contract was for the rehabilitation of the filter bays and associated piping at the Minot Water Treatment Plant Filtration Upgrades as well as the control instrumentation and SCADA (telemetry) for the entire North Tier project works which were operational by the end of 2012 with substantial completion shortly thereafter.

In 2012, 475 million gallons of potable water were distributed to customers through the NAWS project.

Work continued on the Supplemental Environmental Impact Statement with the Bureau of Reclamation and their consultant, CardnoENTRIX. A status update was provided to the Federal Court in October 2013.

The Bureau of Reclamation published the NAWS draft Supplemental Environmental Impact Statement in July of 2014.

5.2 WATER APPROPRIATIONS

5.2.1 BACKGROUND

In 1995, the International Souris River Board adopted a new method for reporting minor project diversions for the purpose of determining apportionment. The new method uses a common set of criteria and ensures that the same criteria will be used in both Saskatchewan and North Dakota. It also involves taking the project lists generated by the Natural Flow Methods Committee and adding newly constructed projects or subtracting cancelled projects each year. The projects that met the criteria in 1993 are the benchmark for all future reporting.

5.2.2 SASKATCHEWAN

In 1993 there were 137 minor projects in the Saskatchewan portion of the Souris River basin that met the new criteria. These projects had an annual diversion of 5 099 cubic decametres (4,134 acre-feet). On December 31, 2008, there were 139 minor projects in the Saskatchewan portion of the basin with an annual diversion of 4 824 cubic decametres (3,912 acre-feet). In 2012 there were five new projects with a total allocation of 5.0 cubic decametres (4.1 acre-feet). The annual diversions totaled 4 829 cubic decametres (3,915 acre-feet). There were no new allocations to be added to minor project diversions in 2013 or 2014.

There were 4 water supply project licenses issued in 2014, but they are being supplied by the City of Weyburn and the City of Weyburn. This pumpage is already accounted for in the apportionment calculations.

5.2.3 NORTH DAKOTA

In 1993 there were 12 minor projects in the North Dakota portion of the Souris River basin upstream of Sherwood that met the new criteria. The projects had an annual diversion of 1 257 cubic decametres (1,019 acre-feet). On December 31, 2014, there were 12 minor projects in the North Dakota portion of the Long and Short Creek basins. The annual diversions totaled 1 423 cubic decametres (1,154 acre-feet).

The diversion from East Branch Short Creek near Columbus, North Dakota, was estimated by correcting for precipitation, evaporation and seepage, and the storage change. The diversion in 2014 was 648 cubic decametres (525 acre-feet). The diversion from the reservoir was added to the minor project diversions for the Long and Short Creek basins to obtain the total diversion of 2 071 cubic decametres (1,679 acre-feet) by the United States.

6.0 HYDROLOGIC CONDITIONS IN 2014

The Saskatchewan Water Security Agency reported that fall 2013 precipitation was well below normal in the Saskatchewan portion of the Souris River basin. Winter precipitation was below normal in the Souris River Basin with below average snowpack. The February 1 2014 data indicated no significant snowfall. Depressional areas were still holding water, however the 30-day local runoff forecast was only 10 000 cubic decametres (8,107 acre-feet).

The United States Geological Survey reported that the total volume of flow past the Long Creek at Noonan gage in 2014 was 38 358 cubic decametres (31,097 acre-feet). This volume is about 200 percent greater than the median flow for the last 54 years. The peak discharge for the reporting period January 1 to December 31, 2014 is 8.2 cubic metres per second (289 cubic feet per second), which ranks 39 in 55 years of record.

On December 31, 2014, Rafferty Reservoir was at an elevation of 549.38 metres (1802.52 feet), or 0.296 metres (0.971 feet) lower than at the beginning of the year. Total inflow to Rafferty Reservoir in 2014 was 54 723 cubic decametres (44,364 acre-feet), and the calculated diversion for 2014 was minus 4 352 cubic decametres (minus 3,528 acre-feet). No water was transferred from Rafferty Reservoir to Boundary Reservoir via the pipeline in 2014.

The main stem inflow to Alameda Reservoir (Moose Mountain Creek above Alameda Reservoir) was 154 612 cubic decametres (125,344 acre-feet), and the calculated diversion for 2014 was 3 615 cubic decametres (2,930 acre-feet). Alameda Reservoir was at an elevation of 561.19 metres (1,841.26 feet) on December 31, 2014, or 0.10 metres (0.33 feet) higher than at the beginning of the year.

Boundary Reservoir received an inflow of 38 358 cubic decametres (31,097 acre-feet) from Long Creek. The calculated diversion for 2014 was -5 561 cubic decametres (4,508 acre-feet). On December 31, 2014, Boundary Reservoir was at an elevation of 560.30 metres (1,838.34 feet), or 0.10 metres (0.33 feet) lower than at the beginning of the year.

On December 31, 2014, the estimated storage in the five major reservoirs in Saskatchewan (Boundary, Rafferty, Alameda, Nickle Lake, and Moose Mountain Lake) was 560 037 cubic decametres (454 022 acre-feet) as compared to storage of 572 677cubic decametres (464,2695 acre-feet) on December 31, 2013.

Figure 1 shows the storage contents of several reservoirs in the Canadian portion of the Souris River basin for 2013 and 2014.

Recorded runoff for the year for the Souris River near Sherwood was 283 455 cubic decametres (229,780 acre-feet), or about 207 percent of the 1931-2014 long-term mean. The artificially drained areas of Yellow Grass Ditch and Tatagwa Lake contributed 10 654 cubic decametres (8,637 acre-feet) during 2014. The peak discharge for the period January 1 to December 31 2014 was 36 cubic meters per second (1,270 cubic feet per second). Figure 2 provides a schematic representation of recorded runoff above Sherwood, North Dakota.

The United States Geological Survey reported the total flow in 2014 for the Souris River at Sherwood was 480 percent greater than the median flow for the past 83 years of record.

On December 31, 2014, the level of Lake Darling was 486.58 metres (1,596.47 feet). The 2014 year-end storage in Lake Darling was 120 056 cubic decametres (103,800 acre-feet), or approximately 4 471 cubic decametres (3,625 acre-feet) more than on December 31, 2013. The 2014 year-end storage in the J. Clark Salyer Refuge pools was 17 455 cubic decametres (14,151 acre-feet), or 24 909 cubic decametres (20,194 acre-feet) less than on December 31, 2013. The combined year-end storage in Lake Darling and the J. Clark Salyer Refuge pools was 137 511 cubic decametres (111,480 acre-feet), well above the 66 600 cubic decametres (54,000 acre-feet) severe drought criterion.

Figure 3 shows the storage contents of the mainstem reservoirs in the United States.

Recorded runoff for the year for the Souris River at Westhope was 972 393 cubic decametres (788,320 acre-feet) or some 688 938 cubic decametres (558,522 acre-feet) more than entered North Dakota at the Sherwood Crossing. The annual runoff for the Souris River near Westhope was 207 percent of the 1929-2014 long-term mean. The minimum flow for the period was 0.88 cubic metres per second (31 cubic feet per second), which occurred on March 7, 2014. The peak discharge for the period January 1 to December 31, 2014 was 116 cubic metres per second (4,110 cubic feet per second) on July 6, which ranks 11 in 84 years of record.

Manitoba reported that precipitation in 2014 was above normal. High rainfall in early July caused local tributaries to have record peak flows much higher than any previously recorded flow. Peak flows on many tributaries were 150 to 200-year events and double the previous floods of record causing overland flooding in numerous locations. The Souris River at Wawanesa remained much above normal throughout summer and at record high flows heading into fall. Souris River flows were at record levels in early winter period and remained at the 90 percentile.

Figure 4 shows the monthly releases from Boundary, Rafferty, Alameda, and Lake Darling Reservoirs.

7.0 SUMMARY OF FLOWS AND DIVERSIONS

7.1 SOURIS RIVER NEAR SHERWOOD

The natural runoff near Sherwood for 2014 was 278 835 cubic decametres (226,052 acre-feet). Depletions in Canada totaled 3 963 cubic decametres (3,213 acre-feet). The additional water received from the Yellow Grass Ditch and Tatagwa Lake Drain basins was 10 654 decametres (8,637 acre-feet). Total depletions in Canada were 6 691 cubic decametres (5,424 acre-feet) less than the additional water received from the Yellow Grass Ditch and Tatagwa Lake Drain basins. The total volume of water released from Boundary, Rafferty, and Alameda Reservoirs in Canada in 2014 was 246 481 cubic decametres (199,822 acre-feet), representing 87 percent of the recorded flow at Sherwood, or 88 percent of the computed natural runoff at Sherwood. A schematic representation of the 2014 flow volumes in the Souris River basin above Sherwood is shown in Figure 2 and the summary of the natural flow computations is provided in Appendix A. It should be noted that Saskatchewan was in surplus on December 31, 2014, by 173 996 cubic decametres (141,059 acre-feet).

The flow of the Souris River at Sherwood was more than 0.113 cubic metres per second (4 cubic feet per second) the entire year. Accordingly, Saskatchewan complied with the 0.113 cubic metres per second (4 cubic feet per second) provision specified in Recommendation No. 1 of the Interim Measures.

7.2 LONG CREEK AND SHORT CREEK

Recorded runoff for Long Creek at the Western Crossing as it enters North Dakota was 21 191 cubic decametres (17,180 acre-feet), or 67.1 percent of the long-term mean since 1959. Recommendation No. 2 of the Interim Measures was met with the increase of runoff on Long Creek between the Western and Eastern Crossings of 17 167 cubic decametres (13,917 acre-feet).

Short Creek, which rises in North Dakota, contributed 22 013 cubic decametres (17,846 acre-feet) to runoff in the Souris River above Sherwood.

7.3 SOURIS RIVER NEAR WESTHOPE

Recorded flow near Westhope during the period of June 1 through October 31, 2014, was 602 899 cubic decametres (488,730 acre-feet). Figure 5 illustrates the recorded flows at Westhope and at Wawanesa near the mouth of the Souris River in Manitoba.

Due to ice conditions the flows in the Souris River near Westhope were estimated for the periods January 1 to March 17 and November 9 to December 31. The peak daily discharge of 116.4 cubic metres per second (4,110 cubic feet per second) occurred on July 6, and ranked 11th in 84 years of discharge record.

The flow at Westhope was in compliance with the 0.566 cubic metres per second (20 cubic feet per second) minimum flow requirement as specified in Recommendation No. 3(a) of the Interim Measures.

8.0 WORKPLAN SUMMARY FOR 2014

The International Souris River Board was created by the International Joint Commission in April 2000 when it combined responsibilities previously assigned under two separate references for the Souris River. The previous references were the International Souris River Board of Control Reference (1959) and the Souris-Red Rivers Engineering Board Reference (1948).

On June 9, 2005, the Board's mandate was further revised through an exchange of diplomatic notes, assigning water quality functions and the oversight for flood forecasting and operations to the Board. The consolidation of water quantity, water quality, and the oversight for flood forecasting and operations is a step in the evolution of the Board as it moves towards an integrated approach to transboundary water issues in the Souris River basin.

The Board determined that a workplan would be beneficial in helping the Board identify resource requirements and deliver on results. The Board agreed that the workplan should include costs related to normal Board activities such as meetings, the annual report, and special projects.

The workplan follows the four strategic initiatives of the International Watershed Initiative.

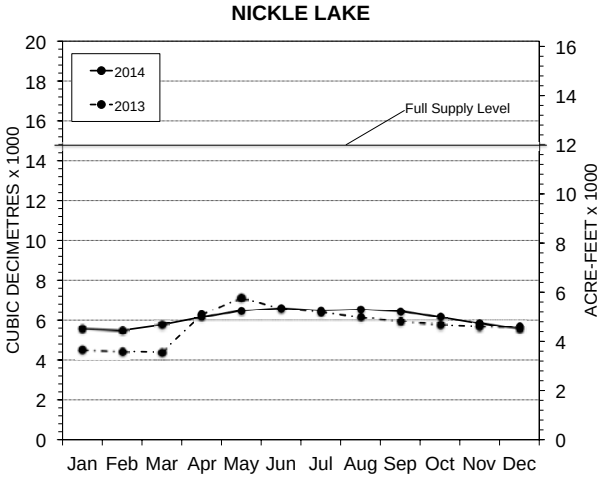
- Build shared understanding of the watershed and related transboundary issues.

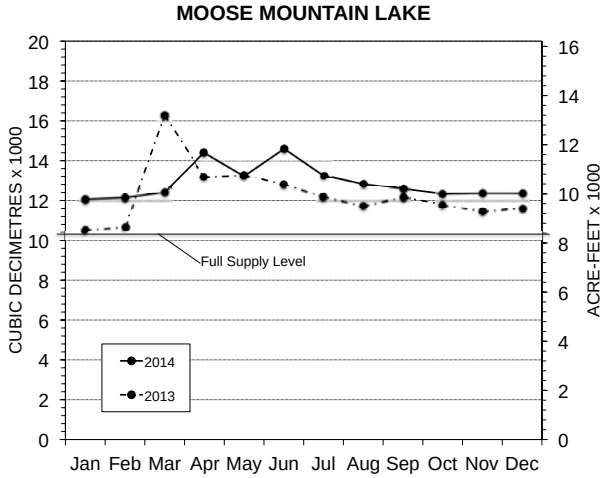
- Communicate watershed issues at the local, regional and national levels to increase awareness, highlight potential issues, and identify opportunities for cooperation and resolution.

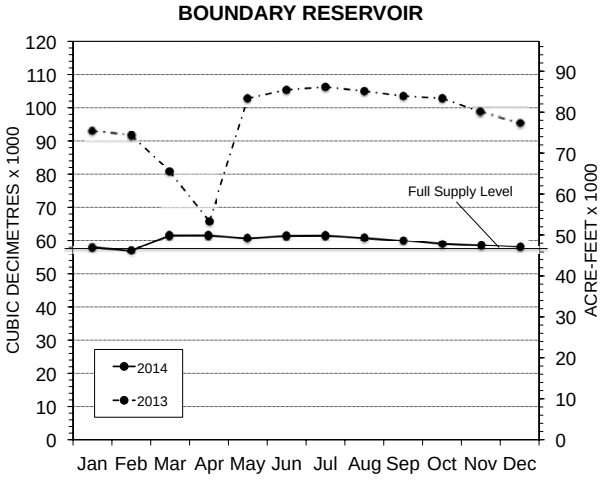
- Contribute to the resolution of watershed issues.

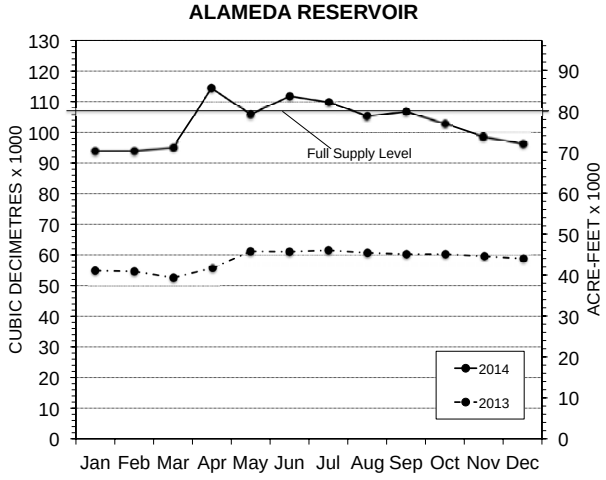
Figure 1

MONTH END CONTENTS OF RESERVOIRS IN CANADA FOR THE YEARS 2013 AND 2014









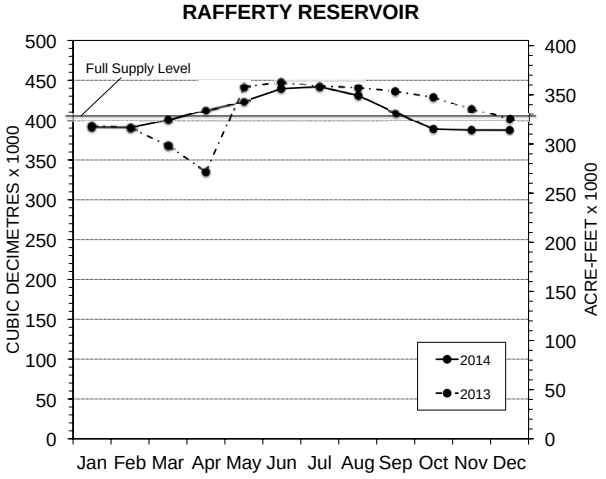


Figure 2

SCHEMATIC REPRESENTATION OF 2014 FLOWS IN THE SOURIS RIVER BASIN ABOVE SHERWOOD, NORTH DAKOTA, U.S.A.

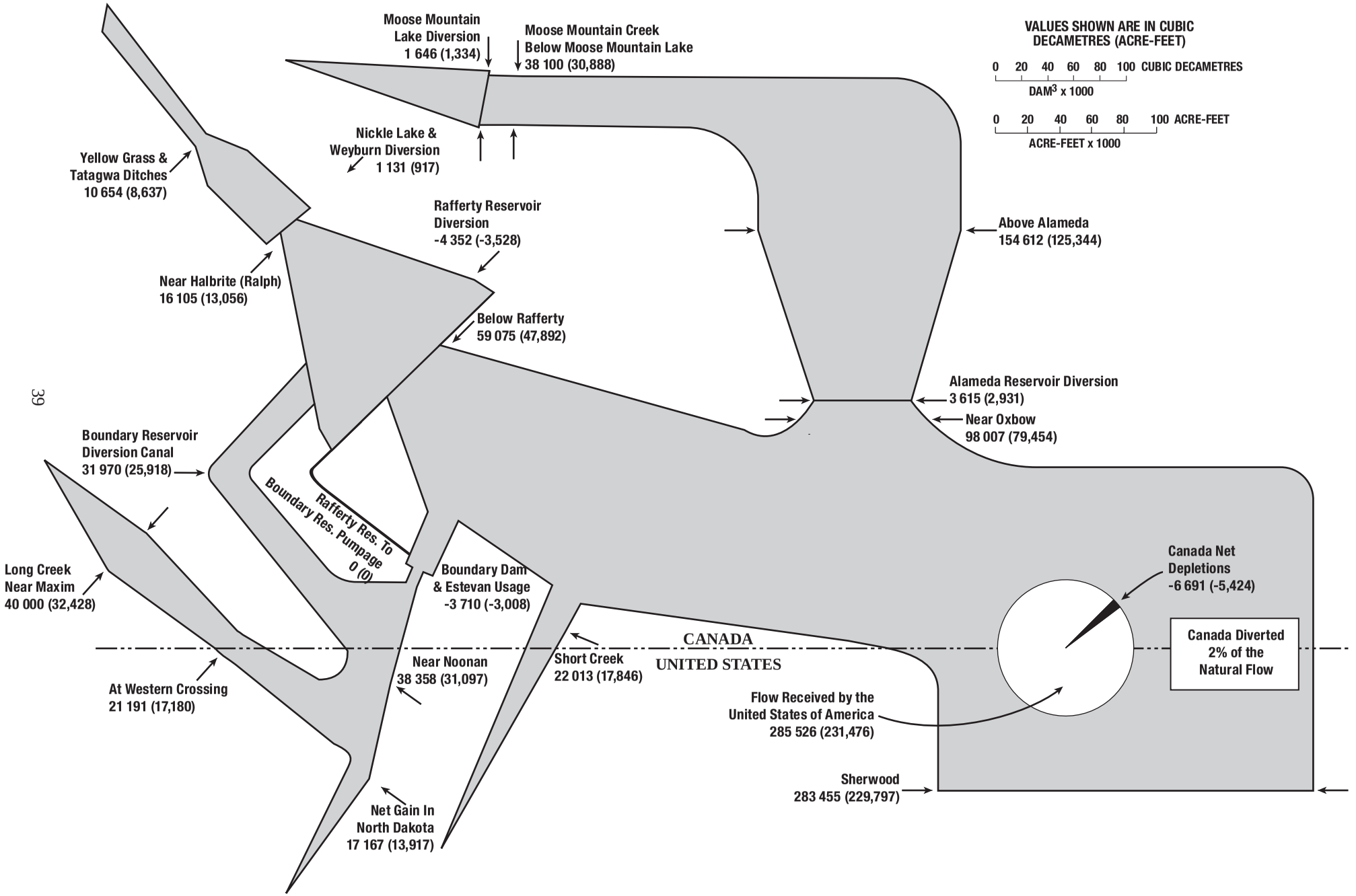
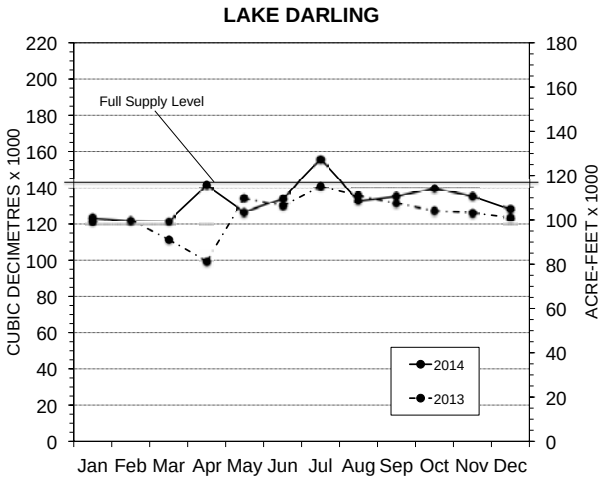
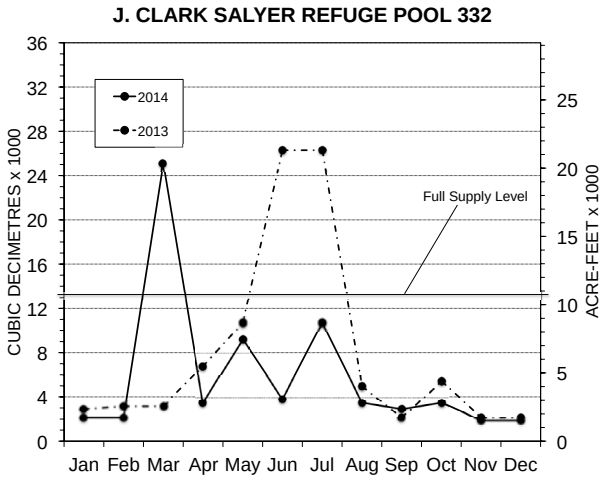
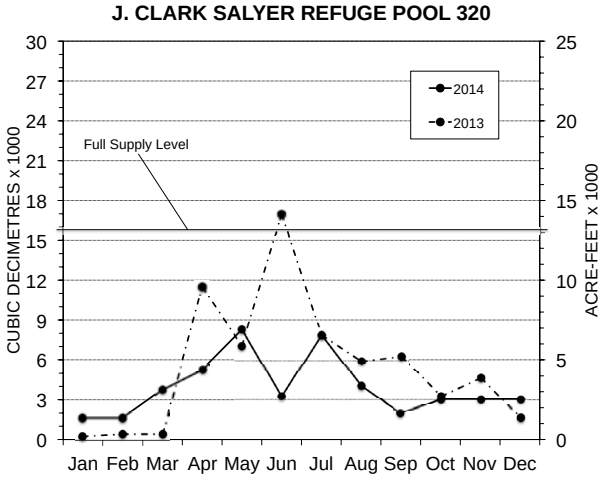


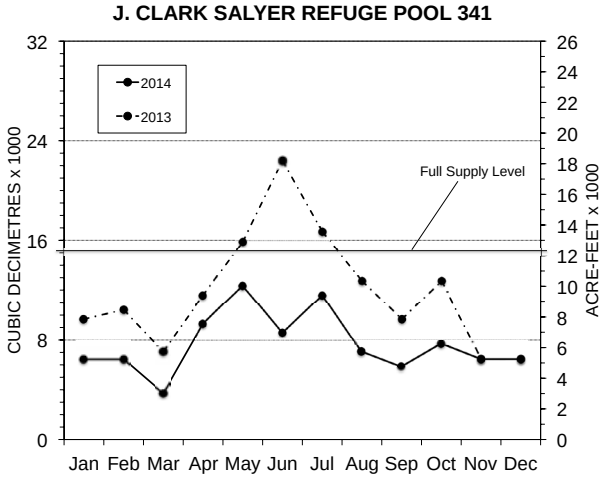
Figure 3

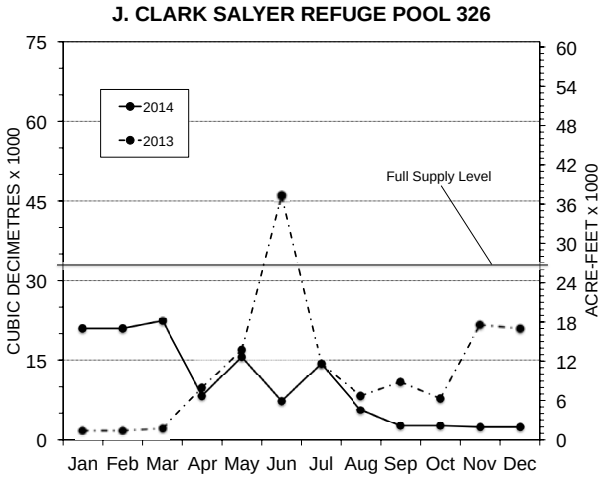
MONTH END CONTENTS OF RESERVOIRS IN USA FOR THE YEARS 2013 AND 2014











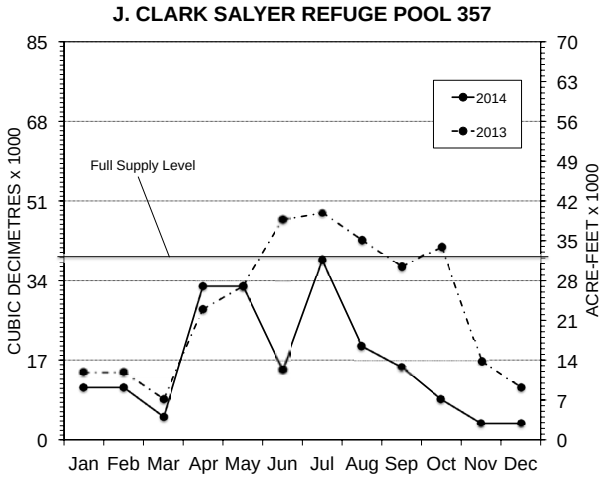


Figure 4

MONTHLY RESERVOIR RELEASES FOR THE YEAR 2014

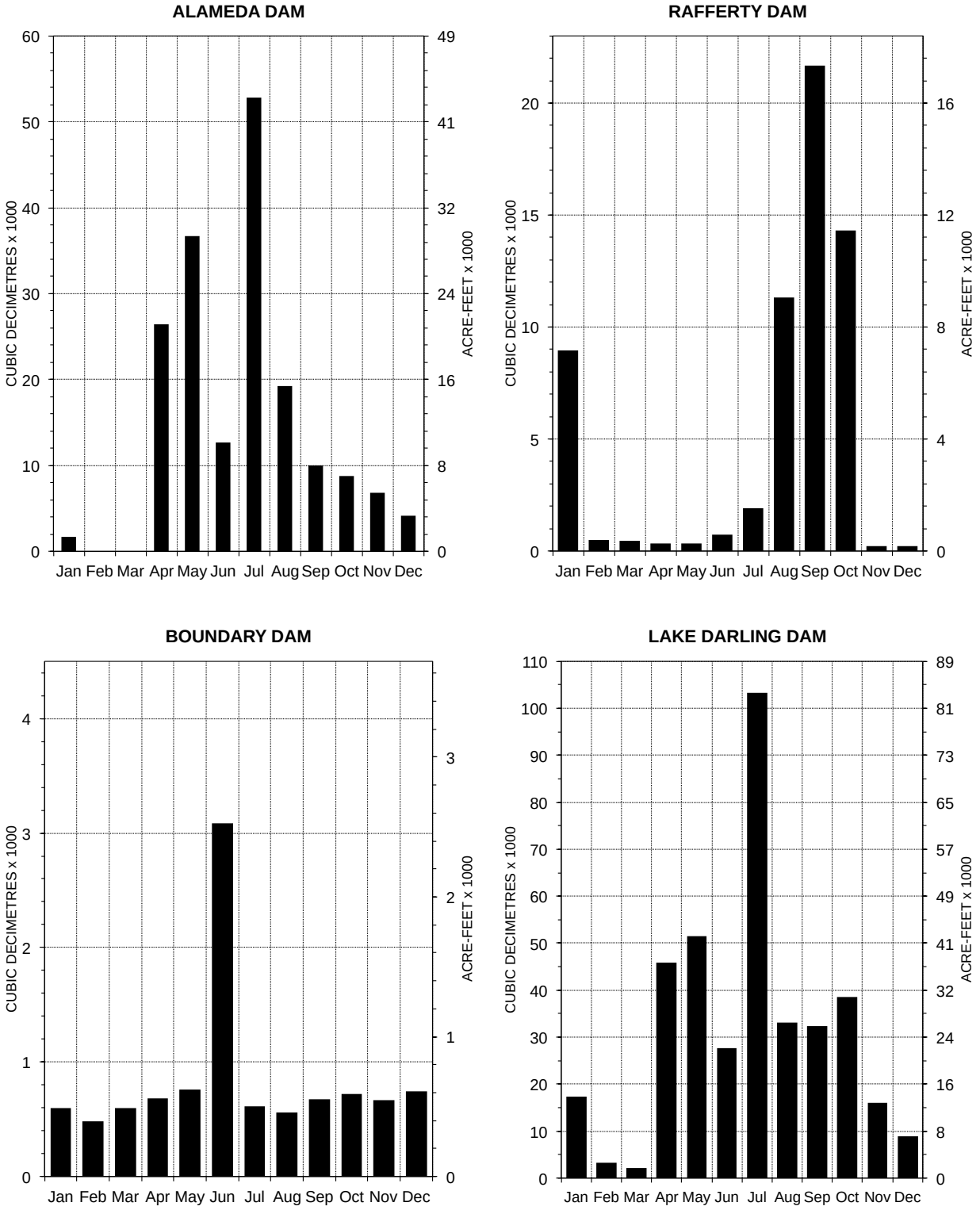
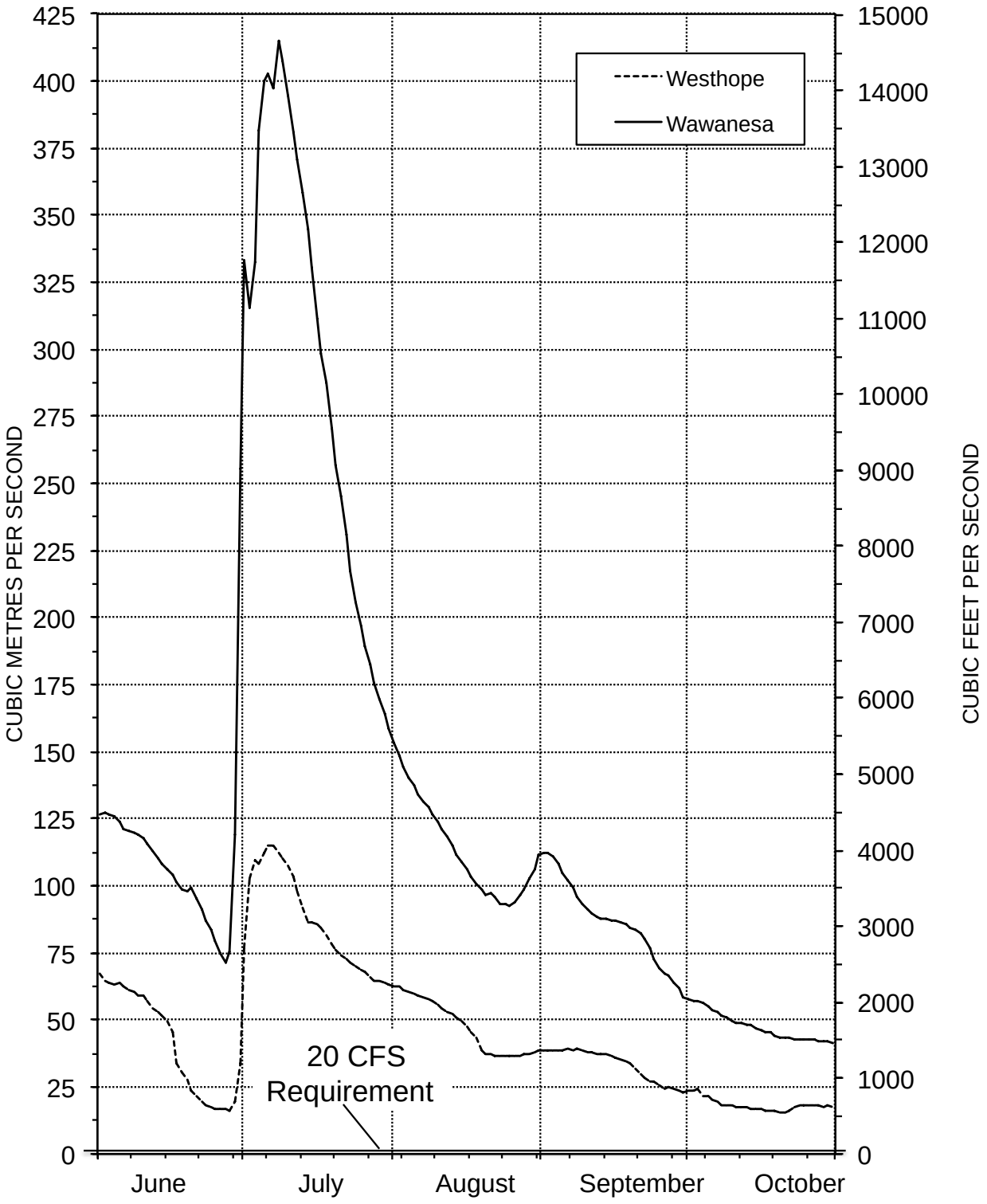


Figure 5

SOURIS RIVER NEAR WESTHOPE
AND
SOURIS RIVER NEAR WAWANESA

June 1, 2014 to October 31, 2014




105°0'0"W
104°30'0"W
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103°30'0"W
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101°30'0"W
50°30'0"N
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49°30'0"N
49°0'0"N
48°30'0"N
48°0'0"N
SASKATCHEWAN
MONTANA
NORTH DAKOTA
Regina
Weyburn
Estevan
Williston
Sidney
SAKIMAY I.R. 74
KAHKEWISTAHAW I.R. 72
COWESSESS I.R. 73
OCHAPOWACE I.R. 71
ASSINIBOINE I.R. 76
PIAPOT I.R. 75
OCEAN MAN I.R. 69
PHEASANT RUMP NAKOTA BAND I.R. 68
WHITE BEAR I.R. 70
Moose Mountain Provincial Park
Kenosee Lake
Lostwood NWR
Des Lacs NWR
Upper Souris NWR
FORT PECK INDIAN RESERVATION
FORT BERTHOLD INDIAN RESERVATION
Lake Sakakawea
Boundary Dam Reservoir
Rafferty Reservoir
Alameda Reservoir
Lumsden
Edenwold
Indian Head
Marieval
Spy Hill
Foxwarren
St Lazare
Wolseley
Grenfell
Broadview
Rocanville
Welwyn
McAuley
Davin
Vibank
Odessa
Kendal
Kronau
Montmartre
Wapella
Rouleau
Sedley
Peebles
Moosomin
Fleming
Kirkella
Wilcox
Francis
Windthorst
Kipling
Riceton
Tyvan
Vandura
Kelso
Milestone
Lewvan
Corning
Colfax
Osage
Wawota
Fairlight
Truax
Lang
Cedoux
Fillmore
Handsworth
Maryfield
Dummer
Parry
Yellow Grass
Creelman
Talmage
Edgeworth
Moreland
McTaggart
Mair
Parkman
Bures
Pangman
Trossachs
Stoughton
Kisbey
Carlyle
Amulet
Griffin
Forget
Arcola
Manor
Ogema
Wauchope
Redvers
Antler
Huntoon
Willmar
Ceylon
Halbrite
Benson
Browning
Radville
Auburnton
Storthoaks
Midale
Goodwater
Lampman
Neptune
Maxim
Macoun
Steelman
Alameda
Tribune
Frobisher
Glen Ewen
Oxbow
Bromhead
Hirsch
Carnduff
Carievale
Gladmar
Minton
Lake Alma
Beaubier
Oungre
Torquay
Outram
Souris
Sybouts
Ambrose
Crosby
Columbus
Fortuna
Noonan
Larson
Lignite
Bowbells
Loraine
Sherwood
Daleview
Outlook
Dooley
Westby
Raymond
Redstone
Portal
North Portal
Plentywood
Antelope
Grenora
Hanks
Alamo
Wildrose
Powers Lake
Donnybrook
Carpio
Reserve
Dagmar
Tioga
White Earth
Ray
Stanley
Palermo
Froid
Epping
Wheelock
Ross
Spring Brook
Brockton
Culbertson
Bainville
Plaza
New Town
Parshall
Makoti
Ryder
Douglas
Andes
Alexander
Rawson
Arnegard
Watford City
Enid
Garrison
Berthold
Burlington
Tolley
Kenmare
Grano
Lansford
Mohall
Loraine
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05NG02
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POOL D-4/4A
POOL D-5
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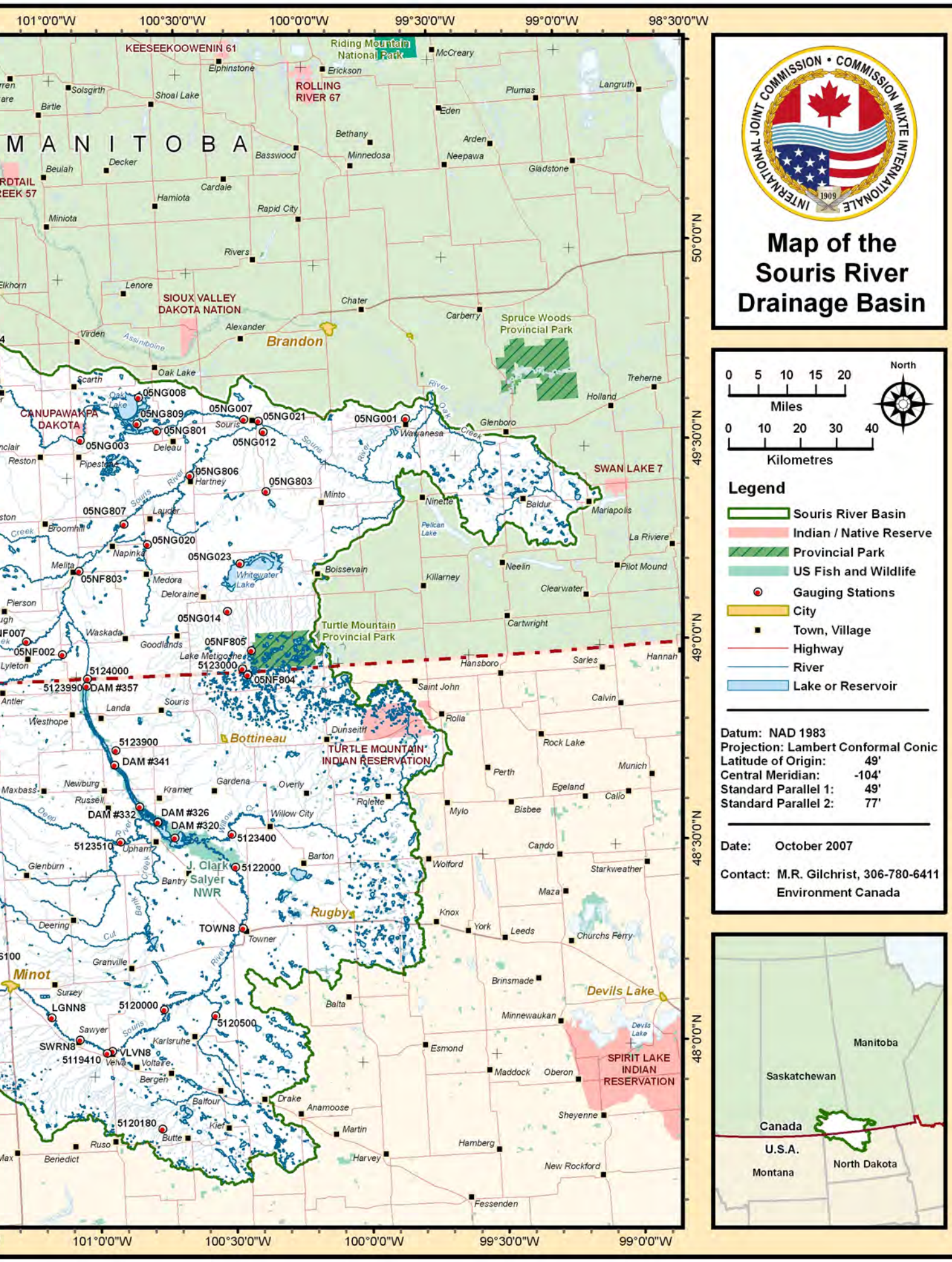

Map of the Souris River Drainage Basin

Datum: NAD 1983
Projection: Lambert Conformal Conic
Latitude of Origin: 49'
Central Meridian: -104'
Standard Parallel 1: 49'
Standard Parallel 2: 77'

Date: October 2007

Contact: M.R. Gilchrist, 306-780-6411
Environment Canada

APPENDIX A

Determination of Natural Flow of Souris River at International Boundary (Sherwood)

DETERMINATION OF NATURAL FLOW OF SOURIS RIVER AT INTERNATIONAL BOUNDARY (SHERWOOD)

All Quantities Reported In Cubic Decametres

FOR THE PERIOD: JANUARY 1 TO DECEMBER 31, 2014

LONG CREEK BASIN

LARSEN RESERVOIR				BOUNDARY RESERVOIR								
				INFLOW	OUTFLOW							
1	2	3	4	5 *	6	7	8	9	10	11	12 *	13
STORAGE CHANGE	EVAPORATION	DIVERSION	TOWN OF RADVILLE PUMPAGE	LONG CREEK AT EASTERN CROSSING	LONG CREEK NEAR ESTEVAN	ESTEVAN PIPELINE	DIVERSION CANAL	TOTAL (OUTFLOW)	DIVERSION	MINOR PROJECT DIVERSION	U.S.A. DIVERSION BETWEEN WESTERN & EASTERN CROSSING	**TOTAL DIVERSION LONG CREEK**
				38358								
83	45	128 (1+2)	30	0 PIPELINE	9728	2221	31970	43919 (6+7+8)	-5561 (5-9)	840	403	-4160 **(3+4+10+11+12)**

UPPER SOURIS RIVER BASIN - ABOVE ESTEVAN

NICKLE LAKE RESERVOIR					ROUGHBARK RESERVOIR			RAFFERTY RESERVOIR				
14	15	16	17	18	19	20	21	22	23	24	25	26
STORAGE CHANGE	EVAPORATION	CITY OF WEYBURN PUMPAGE	DIVERSION	CITY OF WEYBURN RETURN FLOW	STORAGE CHANGE	EVAPORATION	DIVERSION	INFLOW	OUTFLOW	DIVERSION	MINOR PROJECT DIVERSION	**TOTAL DIVERSION UPPER SOURIS RIVER**
									59075			
-200	574	1756	2130 (14+15+16)	999	-15	53	38 (19+20)	54723	0 PIPELINE	-4352 (22-23)	1542	-1641 **(17-18+21+24+25)**

LOWER SOURIS RIVER--ESTEVAN TO SHERWOOD

27	28 *	29	30
CITY OF ESTEVAN NET PUMPAGE	SHORT CREEK DIVERSIONS IN U.S.A.	MINOR PROJECT DIVERSION	**TOTAL DIVERSION LOWER SOURIS RIVER**
1851	1668	1603	5122 **(27+28+29)**

MOOSE MOUNTAIN CREEK BASIN

MOOSE MOUNTAIN LAKE			ALAMEDA RESERVOIR				
31	32	33	34	35	36	37	38
STORAGE CHANGE	EVAPORATION	DIVERSION	STORAGE CHANGE	EVAPORATION	DIVERSION	MINOR PROJECT DIVERSIONS	**TOTAL DIVERSIONS MOOSE MOUNTAIN CREEK BASIN**
493	1153	1646 (31+32)	350	3265	3615 (34+35)	1452	6713 **(33+36+37)**

NON-CONTRIBUTORY BASINS

39	40	41
YELLOW GRASS DITCH	TATAGWA LAKE DRAIN	**TOTAL ADDITIONS**
10295	359	10654 (39+40)

*** DATA CONTRIBUTED BY U.S.G.S.**

SUMMARY OF NATURAL FLOW

42	43 *	44	45	46	47
TOTAL DIVERSION SOURIS RIVER BASIN	RECORDED FLOW AT SHERWOOD	NATURAL FLOW AT SHERWOOD	U..S.A. SHARE	FLOW RECEIVED BY U.S.A.	**SURPLUS (+) OR DEFICIT (-) TO U.S.A.**
			40% OF 44		(46-45) 40% SHARE
			111530		**173996**
6034 (13+26+30+38)	283455	278835 (42+43-41)	50% OF 44	285526 (12+28+43)	(46-45) 50% SHARE

RECOMMENDATION - SECTION 2
ANNUAL FLOW OF LONG CREEK

48	49 *	50
RECORDED FLOW AT WESTERN CROSSING	RECORDED FLOW AT EASTERN CROSSING	**SURPLUS (+) OR DEFICIT (-) FROM U.S.A.**
21191	38358	**17167** (49-48)

APPENDIX B

Equivalents of Measurements

EQUIVALENTS OF MEASUREMENTS

The following is a list of equivalents of measurement that have been agreed to for use in reports of the International Souris River Board.

1 centimetre equals 0.39370 inch
1 metre equals 3.2808 feet
1 kilometre equals 0.62137 mile

1 hectare equals 10 000 square metres
1 hectare equals 2.4710 acres
1 square kilometre equals 0.38610 square mile

1 cubic metre per second equals 35.315 cubic feet per second

The metric (SI) unit that replaces the British acre-foot unit is the cubic decametre (dam^3), which is the volume contained in a cube 10 m x 10 m x 10 m or 1 000 cubic metres.

1 cubic decametre equals 0.81070 acre-feet
1 cubic metre per second flowing for 1 day equals 86.4 cubic decametres
1 cubic foot per second flowing for 1 day equals 1.9835 acre-feet

APPENDIX C

Interim Measures as Modified in 2000

INTERIM MEASURES AS MODIFIED IN 2000

APPENDIX A TO THE DIRECTIVE TO THE INTERNATIONAL SOURIS RIVER BOARD

1. The Province of Saskatchewan shall have the right to divert, store, and use waters which originate in the Saskatchewan portion of the Souris River basin, provided that such diversion, storage, and use shall not diminish the annual flow of the river at the Sherwood Crossing more than 50 percent of that which would have occurred in a state of nature, as calculated by the International Souris River Board. For the purpose of these calculations, any reference to "annual" and "year" is intended to mean the period January 1 through December 31.

   For the benefit of riparian users of water between the Sherwood Crossing and the upstream end of Lake Darling, the Province of Saskatchewan shall, so far as is practicable, regulate its diversions, storage, and uses in such a manner that the flow in the Souris River channel at the Sherwood Crossing shall not be less than 0.113 cubic metre per second (4 cubic feet per second) when that much flow would have occurred under the conditions of water use development prevailing in the Saskatchewan portion of the Souris River basin prior to construction of the Boundary Dam, Rafferty Dam, and Alameda Dam.

   Under certain conditions, a portion of the North Dakota share will be in the form of evaporation from Rafferty and Alameda Reservoirs. During years when these conditions occur, the minimum amount of flow actually passed to North Dakota will be 40 percent of the annual natural flow volume at the Sherwood Crossing. This lesser amount is in recognition of Saskatchewan's operation of Rafferty Dam and Alameda Dam for flood control in North Dakota and of evaporation as a result of the project.

   a. Saskatchewan will deliver a minimum of 50 percent of the annual natural flow volume at the Sherwood Crossing in every year except in those years when the conditions given in (i) or (ii) below apply. In those years, Saskatchewan will deliver a minimum of 40 percent of the annual natural flow volume at the Sherwood Crossing.

      i. The annual natural flow volume at Sherwood Crossing is greater than 50 000 cubic decametres (40,500 acre-feet) and the current year June 1 elevation of Lake Darling is greater than 486.095 metres (1594.8 feet); or

      ii. The annual natural flow volume at Sherwood Crossing is greater than 50 000 cubic decametres (40,500 acre-feet) and the current year June 1 elevation of Lake Darling is greater than 485.79 metres (1593.8 feet), and since the last occurrence of a Lake Darling June 1 elevation of greater than 486.095 metres (1594.8 feet) the elevation of Lake Darling has not been less than 485.79 metres (1593.8 feet) on June 1.

   b. Notwithstanding the annual division of flows that is described in (a), in each year Saskatchewan will, so far as is practicable as determined by the Board, deliver to North Dakota prior to June 1, 50 percent of the first 50 000 cubic decametres (40,500 acre-feet) of natural flow which occurs during the period January 1 to May 31. The intent of this division of flow is to ensure that North Dakota receives 50 percent of the rate and volume of flow that would have occurred in a state of

nature to try to meet existing senior water rights.

c. Lake Darling Reservoir and the Canadian reservoirs will be operated (insofar as is compatible with the Projects' purposes and consistent with past practices) to ensure that the pool elevations, which determine conditions for sharing evaporation losses, are not artificially altered. The triggering elevation of 485.79 metres (1593.8 feet) for Lake Darling Reservoir is based on existing water uses in North Dakota, including refuges operated by the U.S. Fish and Wildlife Service. Each year, operating plans for the refuges on the Souris River will be presented to the Board. Barring unforeseen circumstances, operations will follow said plans during each given year. Lake Darling Reservoir will not be drawn down for the sole purpose of reaching the elevation of 485.79 metres (1593.8 feet) on June 1.

   Releases will not be made by Saskatchewan Watershed Authority from the Canadian reservoirs for the sole purpose of raising the elevation of Lake Darling Reservoir above 486.095 metres (1594.8 feet) on June 1.

d. Flow releases to the United States should occur (except in flood years) in the pattern which would have occurred in a state of nature. To the extent possible and in consideration of potential channel losses and operating efficiencies, releases from the Canadian dams will be scheduled to coincide with periods of beneficial use in North Dakota. Normally, the period of beneficial use in North Dakota coincides with the timing of the natural hydrograph, and that timing should be a guide to releases of the United States portion of the natural flow.

e. A determination of the annual apportionment balance shall be made by the Board on or about October 1 of each year. Any shortfall that exists as of that date shall be delivered by Saskatchewan prior to December 31.

f. The flow release to the United States may be delayed when the State of North Dakota determines and notifies Saskatchewan through the Board that the release would not be of benefit to the State at that time. The delayed release may be retained for use in Saskatchewan, notwithstanding the 0.113 cubic metre per second (4 cubic feet per second) minimum flow limit, unless it is called for by the State of North Dakota through the Board before October 1 of each year. The delayed release shall be measured at the point of release and the delivery at Sherwood Crossing shall not be less than the delayed release minus the conveyance losses that would have occurred under natural conditions between the point of release and the Sherwood Crossing. Prior to these releases being made, consultations shall occur between the Saskatchewan Watershed Authority, the U.S. Fish and Wildlife Service, and the State of North Dakota. All releases will be within the specified target flows at the control points.

2. Except as otherwise provided herein with respect to delivery of water to the Province of Manitoba, the State of North Dakota shall have the right to divert, store, and use the waters which originate in the North Dakota portion of the Souris River basin together with the waters delivered to the State of North Dakota at the Sherwood Crossing under Recommendation (1) above; provided, that any diversion, use, or storage of Long Creek water shall not diminish the annual flow at the eastern crossing of Long Creek into Saskatchewan below the annual flow of said Creek at the western crossing into North Dakota.

3. (a) In addition to the waters of the Souris River basin which originate in the Province of Manitoba, that Province shall have the right, except during periods of severe drought, to receive for its own use and the State of North Dakota shall deliver from any available source during the months of June, July, August, September, and October of each year, six thousand and sixty-nine (6,069) acre-feet of water at the Westhope Crossing regulated so far as practicable at the rate of twenty (20) cubic feet per second except as set forth hereinafter: provided, that in delivering such water to Manitoba no account shall be taken of water crossing the boundary at a rate in excess of the said 20 cubic feet per second.

   (b) In periods of severe drought when it becomes impracticable for the State of North Dakota to provide the foregoing regulated flows, the responsibility of the State of North Dakota in this connection shall be limited to the provision of such flows as may be practicable, in the opinion of the said Board of Control, in accordance with the objective of making water available for human and livestock consumption and for household use. It is understood that in the circumstances contemplated in this paragraph the State of North Dakota will give the earliest possible advice to the International Souris River Board of Control with respect to the onset of severe drought conditions.

4. In event of disagreement between the two sections of the International Souris River Board of Control, the matters in controversy shall be referred to the Commission for decision.

5. The interim measures for which provision is herein made shall remain in effect until the adoption of permanent measures in accordance with the requirements of questions (1) and (2) of the Reference of January 15, 1940, unless before that time these interim measures are qualified or modified by the Commission.

APPENDIX D

Board Directive from January 18, 2007

DIRECTIVE TO THE INTERNATIONAL SOURIS RIVER BOARD

The International Souris River Board was created by the International Joint Commission in April 2000 when it amalgamated the Souris River basin responsibilities previously assigned to the Commission in two separate references by the governments of Canada and the United States. The two references were the International Souris River Board of Control Reference (1959) and the Souris-Red Rivers Engineering Board Reference (1948). The International Souris River Board's mandate changed further through an exchange of diplomatic notes on June 9, 2005 assigning water quality functions and the oversight for flood forecasting and operations as described in Section 4 below. The consolidation of water quantity, water quality, and the oversight for flood forecasting and operations is a step in the evolution of the International Souris River Board as it moves towards an integrated approach to transboundary water issues in the Souris River basin.

This directive replaces the April 11, 2002 Directive to the International Souris River Board and sets out the mandate under which the Board will operate.

1. Pursuant to the Boundary Waters Treaty of 1909 and related agreements, responsibilities have been conferred on the Commission to ensure compliance with apportionment measures for the waters of the Souris River, to investigate and report on water requirements and uses as they impact the transboundary waters of the Souris River basin, and to assist in the implementation and review of the Joint Water Quality Monitoring Program pursuant to the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin.

2. The apportionment measures derive from the approvals given by the governments of Canada and the United States, by letters of March 20, 1959 and April 3, 1959 respectively, to the recommendations made by the Commission in paragraph 22 of its report to the governments of March 19, 1958. Subsequently, with the signing of the Canada-United States Agreement for Water Supply and Flood Control in the Souris River basin on October 26, 1989 (hereafter referred to as the 1989 Agreement), the Interim Measures for apportionment of the Souris River at the Saskatchewan-North Dakota boundary were revised as described in Annex B of the 1989 Agreement. By letters of February 28, 1992, the Commission was requested to monitor compliance with the measures as modified in the 1989 Agreement. By letters of December 20 and 22, 2000, the governments amended Annex B of the 1989 Agreement. The attached Appendix A is a consolidation of the apportionment measures against which the Commission is to monitor compliance.

3. By letters of January 12, 1948, the governments requested the Commission to undertake investigations of water requirements and uses arising out of existing dams and other works or projects in the mid-continent portion of the Canada-United States boundary, including the Souris River basin, and to make advisory recommendations.

4. By exchange of diplomatic notes between the governments of Canada and the United States dated January 14 and June 9, 2005, the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin was formally revised to include a reference pursuant to Article IX of the Boundary Waters Treaty which assigned water quality responsibilities contained in the 1989 Agreement to the Commission. The Commission was requested to assist with the implementation and review of the Joint Water Quality Monitoring Program. On October 21, 2005 at the October 2005 Commission's meeting with governments, the U.S. State Department read a statement into the Commission's formal record that the U.S. State Department is of the opinion the Commission has the authority and has obtained the notification it needs from the U.S. State Department to proceed with carrying out the flood related responsibilities for the Souris River. On April 6, 2006 at the April 2006 Commission's meeting with governments, the Department of Foreign Affairs and International Trade indicated that the Board should be assigned these responsibilities. It is recognized that Article X of the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River basin designates the entities responsible for operation and maintenance of the improvements mentioned in the 1989 Agreement and that the operations will be in accordance with the Operating Plan shown in Annex A of the 1989 Agreement. The Department of Army is the entity designated responsible for flood operations within the United States. The Government of Saskatchewan is the Canadian entity designated responsible for flood operations within the Canadian Province of Saskatchewan.

5. The Board's mandate is to support the Commission's initiative to explore and encourage the development of local and regional capacity with the objective of preventing and resolving transboundary disputes regarding the waters and aquatic ecosystem of the Souris River and its tributaries and aquifers. This would be accomplished through the application of best available science and knowledge of the aquatic ecosystem of the basin and an awareness of the needs, expectations and capabilities of residents of the Souris River basin. The Board's mandate will be accomplished by performing the tasks identified in Clause 6 below.

6. The Board's duties shall be to:

   (i) Maintain an awareness of existing and proposed developments, activities, conditions, and issues in the Souris River basin that may have an impact on transboundary water levels, flows, water quality, and aquatic ecosystem health and inform the Commission about existing or potential transboundary issues.

   (ii) Oversee the implementation of compliance with the Interim Measures As Modified For Apportionment of the Souris River as described in Appendix A of this document by:
      - identifying an adequate hydro-climatic monitoring network to support the determination of natural flow and apportionment balance,
      - encouraging the appropriate authorities to establish and maintain hydro-climatic monitoring and information collection networks and reporting

systems to ensure suitable information is available as required for the determination of natural flow and apportionment balance,

- informing the Commission, in a timely manner, of critical water supply or flow conditions in the basin,
- encouraging appropriate authorities to take steps to ensure that apportionment measures are met, and
- preparing an annual report and submitting it to the Commission.

(iii) Assist the Commission in the review of a Joint Water Quality Monitoring Program (referred to hereafter as "the Program") by:

- developing recommendations on the Program and the setting of water quality objectives,
- exchanging data provided by the Program on a regular basis,
- collating, interpreting, and analyzing the data provided by the Program,
- reviewing the Program and the water quality objectives at least every five years and developing recommendations, as appropriate, to the Commission to improve the Program and the objectives, and
- preparing an annual report containing:
  - a summary of the principal activities of the Board during the year with respect to the Program,
  - a summary of the principal activities affecting water quality in the Souris River Basin during the year,
  - a summary of the collated, interpreted, and analyzed data provided by the Program,
  - a summary of the water quality of the Souris River at the two locations at which it crosses the International Boundary,
  - a section summarizing any definitive changes in the monitored parameters and the possible causes of such changes,
  - a section discussing the water quality objectives for the Souris River at the Saskatchewan/North Dakota boundary and at the North Dakota/Manitoba boundary as established and revised pursuant to the 1989 Agreement,
  - a section summarizing other significant water quality changes and the possible causes of such changes, and
  - recommendations on new water quality objectives or on how existing water quality objectives can be met, including suggestions on water quality as it relates to water quantity during periods of low flow, in the event that the annual report indicates that the water quality objectives have not been attained as a result of activities pursued under the 1989 Agreement.

(iv) Perform an oversight function for flood operations in cooperation with the designated entities identified in the 1989 Canada-United States Agreement for Water Supply and Flood Control in the Souris River Basin by:

- ensuring mechanisms are in place for coordination of data exchange, flood forecasts and communications related to flood conditions and operations;
- determining whether the operations under the 1989 Agreement should proceed based on the Flood Operation or Non-Flood Operation of the Operating Plan, which is Annex A to the 1989 Agreement, using its criteria and informing designated agencies of this determination;
- reporting to the Commission on any issues related to flood operations and management; and
- providing the Commission and the designated entities under the 1989 Agreement recommendations on how flood operations and coordination activities could be improved.

(v) Report on aquatic ecosystem health issues in the watershed, regularly informing the Commission on the state and implications of aquatic ecosystem health, and encourage the appropriative authorities to establish and maintain water quality and other monitoring and information collection networks and reporting systems to ensure suitable information is available as required for the determination of the health of the aquatic ecosystem.

(vi) Carry out such other studies or activities as the Commission may, from time to time, request.

(vii) Prepare an annual work plan including both routine board activities and new initiatives planned to be conducted in the subsequent year. The work plan shall be submitted annually to IJC for review.

7. The Board shall provide opportunities for the public to be involved in its work, including at least one public meeting in the basin each year.

8. The Board shall coordinate and collaborate with other agencies and institutions both within and outside the Souris River basin as may be needed or desirable, and facilitate the timely dissemination of pertinent information within the basin. The Board shall keep the Commission informed of these activities.

9. The Board shall have an equal number of members from each country. The Commission shall normally appoint each member for a three-year term. Appointments may be renewed for additional terms. Members shall act in their personal and professional capacity, and not as representatives of their countries, agencies or institutions. The Commission shall appoint Canadian and United States co-chairs of the Board and will strive to appoint chairs with complementary expertise that encompasses a broad spectrum of basin issues.

10. The co-chairs of the Board shall be responsible for maintaining proper liaison between the Board and the Commission, and among the Board members.

11. The co-chairs shall ensure that members of the Board are informed of all instructions, inquiries, and authorizations received from the Commission and also of activities undertaken by or on behalf of the Board, progress made, and any developments affecting such progress.

12. The co-chairs may appoint secretaries of the Board who, under the general supervision of the co-chairs, shall carry out such duties as are assigned by the co-chairs or the Board as a whole.

13. The Board may establish such committees and working groups as may be required to fulfill its responsibilities in a knowledgeable and effective manner. The Commission shall be kept informed of the duties and composition of any committee or working group.

14. Unless other arrangements are made with the Commission, members of the Board, committees, or working groups shall make their own arrangements for reimbursement of necessary expenditures for travel or other related expenses.

15. The Board shall inform the Commission in advance of plans for any meetings, or other means of involving the public in Board deliberations, and shall report to the Commission, in a timely manner, on these and any other presentations or representations made to the Board.

16. The Board shall conduct its public outreach activities in accordance with the Commission's public information policies and shall maintain files in accordance with the Commission policy on segregation of documents.

17. Prior to their release, the Board shall provide the text of media releases and other public information materials to the Secretaries of the Commission for review by the Commission's Public Information Officers.

18. The Board shall submit an annual report covering all of its activities, including the annual report regarding the Program and the work plan, as described in Section 6 above, to the Commission, at least three weeks in advance of the Commission's fall semi-annual meeting, and the Board shall submit other reports as the Commission may request or the Board may feel appropriate in keeping with this Directive. Reports shall be submitted in a format suitable for public release and electronic copies shall be provided to each of the Commission's section offices.

19. Reports, including annual reports, minutes and correspondence of the Board shall, normally, remain privileged and be available only to the Commission and to members of the Board and its committees until their release has been authorized by the Commission. The Board shall provide minutes of Board meetings to the Commission within 45 days of the close of the meeting in keeping with the Commission's April 2002 Policy Concerning Public Access to Minutes of Meetings. The minutes will subsequently be put on the Commission's web site.

20. If, in the opinion of the Board or of any member, any instruction, directive, or authorization received from the Commission lacks clarity or precision, the matter shall be referred promptly to the Commission for appropriate action.

21. The Board shall operate by consensus. In the event of any disagreement among the members of the Board which they are unable to resolve, the Board shall refer the matter forthwith to the Commission for decision.

22. The Commission may amend existing instructions or issue new instructions to the Board at any time.

Signed this 18th day of January, 2007

Elizabeth Bourget
Secretary
United States Section

Murray Clamen
Secretary
Canadian Section

APPENDIX E

Water Quality Data for Sherwood and Westhope

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER - NORTH DAKOTA/SASKATCHEWAN BOUNDARY 2014
STATION 05114000 SHERWOOD USGS

WATER QUALITY PARAMETERS	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA* Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	%EXCEEDANCE	TRENDS	POTENTIAL ACTIONS
Biological Parameters							
Fecal Coliform	200/100 ml	#/100 mL	30 (8,300-<1) 196	NDA	0		
E. coli	In development	#/100mL	NDA	35 (50-20) 2			
Inorganic Parameters							
Ammonia (un-ionized as N)	****	mg/L	0.001 (0.025-<0.001) 222	0.02 (0.09 - <0.01) 8	0		
Chloride	100	mg/L	42 (220-4) 347	19.65 (26.4 – 13.6) 8	0		
Fluoride	1.5	mg/L	0.2 (1.8-<0.1) 345	0.16 (0.18 – 0.13) 8	0		
NO_2 + NO_3(as N) dissolved	1.0	mg/L	0.1 (1.4-<0.01) 309	0.173 (0.347 – 0.04) 8	0		
Phosphorus(total P)	0.10	mg/L	0.19 (1.9-0.02) 386	0.25 (0.35 – 0.18) 8	100		
Sodium	100	mg/L	120 (532-14) 345	86.4 (138 – 61.7) 8	37.5		
Sulfate	450	mg/L	233 (1,000-45) 347	339 (426 – 143) 8	0		
Arsenic (total)	50	µg/L	<4.0 (28.3-<0.1) 182	4.85 (5.9 – 3.3) 8	0		
Barium(total)	1,000	µg/L	<100 (300-14.7)181	84.15 (120 – 60.8) 8	0		
Boron(total)	500	µg/L	192 (3,500-40) 179	119 (153 – 79) 8	0		
Beryllium(total)	100	µg/L	<10 (43.5-<0.02) 181	0.045 (0.13 – 0.02) 8	0		
Cadmium(total)	***27	µg/L	<1 (<2-<0.01) 180	0.048 (0.084 – 0.03) 8	0		
Chromium(total)	50	µg/L	<1(30-<0.3) 180	1.25 (2.9 – 0.66) 8	0		
Cobalt(total)	50	µg/L	0.92 (2-0.25) 180	0.855 (1.9 – 0.47) 8	0		
Copper(total)	***30	µg/L	2.5 (20-<0.8) 174	2.7 (4.6 – 1.7) 8	0		
Iron(total)	300	µg/L	621 (10,000-60) 188	1170 (3230 – 699) 8	100		

***based on hardness of 300 mg/L
****unionized ammonia is calculated using temperature and pH
NDA: No Data Available
NC: Not Calculated

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER - NORTH DAKOTA/SASKATCHEWAN BOUNDARY 2014
05114000 SHERWOOD USGS

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	%EXCEEDANCE	TRENDS	POTENTIAL ACTIONS
Lead(total)	***13	µg/L	<1 (4.54 - 0.1) 184	0.73 (1.87 – 0.4) 8	0		
Mercury	0.5 ug/g in fish flesh	µg/L	NDA	NDA			
Molybdenum(total)	10	µg/L	2.76 (45 - 0.48) 184	2.79 (4.92 – 2.12) 8	0		
Nickel(total)	***220	µg/L	4 (17- <1) 195	4.3 (6.8 – 3.1) 8	0		
Selenium(total)	5	µg/L	<1(14 - <0.211) 181	0.42 (0.603 – 0.326) 8	0		
Zinc(total)	30	µg/L	8.8 (620 - <2) 229	8.65 (20.1 – 2.6) 8	0		
Miscellaneous							
Total Dissolved Solids	1,000	mg/L	727 (2,310 - 159) 247	780 (918 – 442) 8	0		
Total Suspended Solids	the lesser of 10 mg/L or 10% over ambient	mg/L	16 (164 - <1) 223	48.5 (164 - <30) 8	*		
pH (range)	8.5-6.5	standard units	8.1 (9.2-6.9) 464	8.05 (8.2 – 7.7) 8	0		
Dissolved Oxygen (conc.)	>5.0	mg/L	8.1 (19.4-0.0) 452	9.95 (12.9 – 8.0) 8	0		
Aesthetics		visual	NDA		NDA		
Oil and Grease		visual	NDA		NDA		

* Water Quality Objective now below detection limit
*** based on a hardness of 300 mg/L
NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER NORTH DAKOTA/SASKATCHEWAN BOUNDARY 2014
STATION 05114000 SHERWOOD USGS

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	%EXCEEDANCE	TRENDS	POTENTIAL ACTIONS
Organic Parameters							
Atrazine	2	µg/L	<0.05 (0.03 - <0.001) 25	0.0036 (0.0087-0.0028) 6	0		
Bromoxynil	5	µg/L	NDA	<0.006(<0.006) 6	0		
Carbaryl	90	µg/L	<0.003 (<0.003) 17	<0.003 (<0.003) 6	0		
Chlordane	0.0043	µg/L	<0.10 (0.10 - <0.10) 40	NDA	0		
DDT	0.001	µg/L	<0.01 (0.02 - <0.01) 40	NDA	0		
Dieldrin	0.0019	µg/L	<0.01 (0.03 - <0.01) 40	NDA	0		
Dicamba	In development	µg/L	<0.01 (<0.01) 16	<0.01 (<0.01) 6	0		
Diclofop-methyl	In development	µg/L	NDA	NDA	0		
Heptachlor	0.0038	µg/L	<0.01 (0.15 - <0.01) 40	NDA	0		
MCPA	0.20	µg/L	0.0031 (0.0063 - <0.0023) 12	0.0048 (0.0049-0.0047) 5	0		
Parathion	0.04	µg/L	<0.01(<0.01) 52	<0.01 (<0.01) 6	0		
Picloram	0.05	µg/L	<0.01(<0.01) 16	<0.01 (<0.01) 6	0		
Phenols(total)	1.0	µg/L	<17 (26 - <17) 225[a]	<50 (<50 – 10) 5	NC		
Polychlorinated biphenyl (total)	0.001	µg/L	<0.1 (0.3 - <0.1) 39	NDA	0		
Triallate	0.57	µg/L	<0.001 (0.035 - <0.001) 22	<0.001(<0.001) 5	0		
Trifluralin	0.10	µg/L	<0.002 (0.084 - <0.002) 17	NDA	0		
2,4-D	4.0	µg/L	0.02 (0.013 - 0.0071) 39	0.0105 (0.013 – 0.0071) 6	0		

NDA: No Data Available
NC: Not calculated
< symbol represents samples where parameter was below the reporting limit.
[a] Due to the difficulty involved in phenol analysis, the historic data was resensored to the highest detection limit that occurred during the period of record (<17). During this time detection limits have varied between <1 and <17. Values recorded above the method detection limit specific to each sample range from 1 to 26 during the period of record.
[b] Annual phenol data was also resensored to the highest detection limit that occurred during 2013 (<7).

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER - MANITOBA/NORTH DAKOTA BOUNDARY 2014
00US05NF0001 WESTHOPE – ENVIRONMENT CANADA

WATER QUALITY PARAMETERS	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA* Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	%EXCEEDANCE	TRENDS	POTENTIAL ACTION
Biological Parameters							
Fecal Coliform	200/100 ml	#/100 ml	<10 (2300-<2) 436	<10 (32-<2) 8	0		
E.Coli	IN DEVELOPMENT	#/100 ml	<10 (2800-<2) 63	<10 (2800-4) 8			
Inorganic Parameters							
Ammonia (un-ionized as N)	****	mg/L	0.004 (0.433-0) 211	0.003 (0.01-0.002) 4			
Chloride	100	mg/L	28 (297-1.2) 582	21 (35-13.8) 7	0		
Fluoride	1.5	mg/L	0.2 (0.98-<0.01) 620	0.11 (0.2-0.07) 7	0		
NO_2 + NO_3(as N) dissolved	1.0	mg/L	<0.01 (0.848-<0.01) 218	0.041 (0.402-<0.01) 7	0		
Phosphorus(total P)	0.10	mg/L	0.31 (4.52-0.09) 211	0.252 (0.34-0.107) 7	100		
Sodium	100	mg/L	115 (1040-6.4) 827	100 (166-44.6) 7	43		
Sulfate	450	mg/L	190.5 (3490-4.8) 828	313 (535-144) 7	29		
Arsenic (total)	50	µg/L	5.66 (33.4-1.87) 111	4.11 (6.31-2.85) 8	0		
Barium(total)	1,000	µg/L	83.85 (631-0.0432) 111	79.9 (109-40.7) 8	0		
Boron(total)	500	µg/L	199 (2080-41) 111	143.5 (218-65.6) 8	0		
Beryllium(total)	100	µg/L	0.016 (0.091-0.001) 111	0.0085 (0.024-<0.001) 8	0		
Cadmium(total)	***27	µg/L	0.015 (0.12-0.0001) 111	0.016 (0.053-0.008) 8	0		
Chromium(total)	50	µg/L	0.31 (2.36-0.07) 111	0.245 (0.47-0.09) 8	0		
Cobalt(total)	50	µg/L	0.491 (4.97-0.197) 111	0.491 (0.59-0.298) 8	0		
Copper(total)	***30	µg/L	1.66 (4.59-0.32) 111	1.455 (2.46-0.93) 8	0		
Iron(total)	300	µg/L	335 (14500-13.9) 111	182.5 (493-13.9) 8	25		

***based on hardness of 300 mg/L
****unionized ammonia is calculated using temperature and pH
NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER - MANITOBA/NORTH DAKOTA BOUNDARY 2014
00US05NF0001 WESTHOPE – ENVIRONMENT CANADA

WATER QUALITY PARAMETERS	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA* Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	%EXCEEDANCE	TRENDS	POTENTIAL ACTION
Lead(total)	***13	µg/L	0.263 (5.17-0.027) 111	0.206 (0.598-0.027) 8	0		
Mercury	0.5 ug/g in fish flesh	µg/g					
Molybdenum(total)	10	µg/L	3.09 (35.2-0.591) 111	2.05 (4.73-1.61) 8	0		
Nickel(total)	***220	µg/L	3.58 (24.7-1.9) 111	3.09 (4.51-2.61) 8	0		
Selenium(total)	5	µg/L	0.42 (1.81-<0.05) 111	0.495 (0.73-0.38) 8	0		
Zinc(total)	30	µg/L	1.87 (10.7-0.3) 111	1.1 (3.4-0.6) 8	0		
Miscellaneous							
Total Dissolved Solids	1,000	mg/L	757 (3821.074-129) 297	794.33 (1215-562) 6	33		
Total Suspended Solids	the lesser of 10 mg/L or 10% over ambient	mg/L	14 (300-<1) 609	11.6 (32-4.4) 7			
pH (range)	8.5-6.5	standard units	8.3 (9.85-6.8) 489	8.56 (9.05-7.52) 8	75		
Dissolved Oxygen (conc.)	>5.0	mg/L	8.4 (23.57-0.05) 492	9.69 (23.57-7.03) 8	0		
Aesthetics		visual	NDA	NDA			
Oil and Grease		visual	NDA	NDA			

NDA: No Data Available

ANNUAL WATER QUALITY OBJECTIVES SUMMARY
SOURIS RIVER - MANITOBA/NORTH DAKOTA BOUNDARY 2014
00US05NF0001 WESTHOPE – ENVIRONMENT CANADA

WATER QUALITY PARAMETER	WATER QUALITY OBJECTIVE	UNITS	HISTORIC DATA Median(max-min)#samples	ANNUAL DATA Median(max-min)#samples	%EXCEEDANCE	TRENDS	POTENTIAL ACTION
Organic Parameters							
Atrazine	2	µg/L	0.1 (46.4-0.003) 141	27.35 (28.1-26.6) 2	100		
Bromoxynil	5	µg/L	<0.0213 (0.202-0.00099) 120	<1.33 (<1.33-<1.33) 2			
Carbaryl	90	µg/L	NDA	NDA			
a-Chlordane	0.0043	µg/L	<0.003 (0.003-<0.00014) 238	0.62 (<0.62-<0.62) 3			
g-Chlordane	0.0043	µg/L	<0.002 (<0.002-<0.00004) 238	<0.31 (<0.31-<0.31) 3			
DDT	0.001	µg/L	<1 (<4.0-<0.00004) 240	<0.56 (<0.56-<0.56) 3			
Dieldrin	0.0019	µg/L	<0.002 (<0.002-<0.00018) 280	1.07 (<1.07-<1.07) 3			
Dicamba	In development	µg/L	<0.03 (17.3-<0.00073) 157	12.4 (17.3-7.55) 2			
Diclofop-methyl	In development	µg/L	<42.3 (<42.3-<7.35) 132	<7.35 (<7.35-<7.35) 2			
Heptachlor	0.0038	µg/L	<0.001 (<0.56-<0.00014) 274	<0.56 (<0.56-<0.56) 3			
MCPA	0.20	µg/L	0.2 (153-<0.00058) 276	18.3 (22.9-13.7) 2	100		
Parathion	0.04	µg/L	<0.0155 (<0.088 <0.0155) 25				
Picloram	0.05	µg/L	0.05 (60.7-<0.00033) 219	47 (50.5-43.5) 2	100		
Phenols(total)	1.0	µg/L	NDA	NDA			
Polychlorinated biphenyl (total)	0.001	µg/L	<0.00034 (<0.0102-<0.00021) 45	NDA			
Triallate	0.57	µg/L	<0.00864 (0.072-0.0013) 139	<2.22 (<2.22-<2.22) 2			
Trifluralin	0.10	µg/L	<0.005 (0.01-<0.00266) 143	<2.66 (<2.66-<2.66) 2			
2,4-D	4.0	µg/L	0.0324 (233-0.00047) 284	53.45 (60.9-46) 2	100		

NDA: No Data Available

APPENDIX F

Water Quality Monitoring Plan for Sherwood and Westhope

1. Sherwood Monitoring Plan

Season	No. of Site Visits	No. of Samples Per Year			
		Dissolved Oxygen	Major Ions	Nutrients	Trace Elements
1 (Mar-Jun)	2	2	2	2	2
2 (Jul-Oct)	4	4	4	4	4
3 (Nov-Feb)	1	1	1	1	1
TOTAL	7	7	7	7	7

2. Westhope Monitoring Plan

Season	No. of Site Visits	No. of Samples Per Year				
		Dissolved Oxygen	Major Ions	Nutrients	Trace Elements	Pesticides
1 (Mar-Jun)	3	3	3	2	3	3
2 (Jul-Oct)	3	3	2	3	2	1
3 (Nov-Feb)	2	2	2	2	2	
TOTAL	8	8	7	7	7	4