PRAIRIE PROVINCES WATER BOARD

2015 ANNUAL REPORT

CANADA · ALBERTA · SASKATCHEWAN · MANITOBA

PRAIRIE PROVINCES WATER BOARD

ANNUAL REPORT

FOR THE FISCAL YEAR

APRIL 1, 2015 TO MARCH 31, 2016

ISSN 0704-8726

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LETTER OF TRANSMITTAL

January 10, 2017

Honourable Catherine McKenna
Minister of the Environment and
Climate Change
Ottawa, Ontario

Honourable Shannon Phillips
Minister of Alberta Environment and Parks
Edmonton, Alberta

Honourable Lawrence MacAulay
Minister of Agriculture & Agri-Food
Ottawa, Ontario

Honourable Cathy Cox
Minister of Sustainable Development
Winnipeg, Manitoba

Honourable Scott Moe
Minister Responsible for the
Saskatchewan Water Security Agency
Regina, Saskatchewan

Honourable Blaine Pedersen
Minister of Manitoba Infrastructure
Winnipeg, Manitoba

Honourable Ministers:

On behalf of the members of the Prairie Provinces Water Board (PPWB), it is my pleasure to submit herewith the Annual Report of the Prairie Provinces Water Board for the fiscal year from April 1, 2015 to March 31, 2016.

The annual report summarizes the activities of the PPWB, its secretariat and its four technical committees. It confirms that jurisdictional commitments for water apportionment and water quality were met in 2015-2016.

During the period covered by this report the PPWB discussed and made progress on a number of important fronts. The PPWB:

- Continued its work on the development of a groundwater schedule (Schedule F) to the Master Agreement on Apportionment (MAA);
- Ratified water quality objectives in July 2015 that will position the PPWB to make more informed water quality management recommendations;
- Continued its work on nutrient investigations by investigating non-point and point nutrient sources in two watersheds; and,
- Approved the report titled "Response to the 2011 Pesticide Excursions in Transboundary Rivers in the Prairie Provinces of Canada". The report concludes that, based on the pesticide monitoring that has been conducted, there were frequent occurrences of pesticides within the acid herbicide group that exceeded the interprovincial water quality objectives. Regular and frequent exceedance of these acid herbicides provides sufficient evidence to warrant further examination of pesticides in transboundary rivers. Based on these findings, the report contains key recommendations such as notification of regular occurrences of acid herbicide excursions, request for additional pesticide data and potential impacts for each jurisdiction, and request in the increase in pesticide monitoring for acid herbicide groups for select rivers.

A copy of the report "Response to the 2011 Pesticide Excursions in Transboundary Rivers in the Prairie Provinces of Canada" is also attached for your reference.

Sincerely,

Cheryl Baraniecki
Chair
Prairie Provinces Water Board

MESSAGE FROM THE CHAIR

The Prairie Provinces Water Board (PPWB) continues to be a vital institution of governance in the prairies that facilitates sound and collaborative management of shared water resources.

In 2015 - 2016, the PPWB continued to be guided by its Strategic Plan, approved in 2006, and revised in 2012. This Strategic Plan ensures the PPWB delivers on its mandate to monitor whether the commitments made in the *Master Agreement on Apportionment (MAA)* have been met by the Signatory Parties.

Further to its core mandate, the PPWB continued to track and respond to other important water management issues. In June 2015, the interprovincial water quality objectives were updated for the first time since their implementation in 1992. The 2015 interprovincial water quality objectives were ratified at a PPWB Ministerial signing ceremony that took place in Winnipeg, Manitoba. There are now 71 interprovincial water quality objectives established for 12 transboundary river reaches. The updated objectives came into effect in July 2015 and will position the Board to make more informed water quality management decisions. The updated water quality objectives are designed to protect water uses including the protection of aquatic life, source water, recreation, agriculture uses and fish consumption.

Work on nutrient investigations continued to be a priority, therefore a nutrient investigation on quantifying both non-point and point sources of nutrients in two watersheds continues. Additionally, a prairie water quality workshop focusing specifically on nutrients and emerging issues is being organized for Fall 2016. This is the first prairie water quality workshop organized by the Committee on Water Quality.

The PPWB continued its discussion on the development of an Agreement on Transboundary Aquifers to be proposed for addition to the *MAA*. Finally, the PPWB continued to provide a cooperative forum for discussion of transboundary water issues including droughts, floods and the growing risk of invasive species in Prairie watersheds.

I wish to thank Jim Gerhart and Scott Roy for their participation on the Board. Jim Gerhart, Board Member representing Saskatchewan, retired in September 2015 and Scott Roy, Alternate Board Member representing the Government of Canada, retired in July 2015. In August 2015, Susan Ross was appointed as the Alternate Board Member for Saskatchewan, and in February 2016, Dave Zapshala was appointed as the Alternate Board Member representing the Government of Canada. I welcome them to the Board and look forward to working with them.

The success of the PPWB is dependent on the work of the Secretariat and the four standing committees, including the Committee on Hydrology (COH), the Committee on Water Quality (COWQ), the Committee on Groundwater (COG) and the Committee on Flow Forecasting (COFF). Dedication and engagement by board members, jurisdictional representatives on committees, and the Secretariat are essential, and much appreciated.

Cheryl Baraniecki
Chair

MESSAGE FROM THE EXECUTIVE DIRECTOR

During 2015 - 2016, the work of the PPWB Secretariat and four standing committees focused on achieving the goals outlined in the PPWB Strategic Plan and activities listed in the 2012 - 2017 Work Plan. A renewal of the Work Plan was approved by the Board in November 2015. The renewed five-year Work Plan provides direction until March 2021

During 2015, agreed transboundary apportionment of flows on all eastward flowing streams was achieved for all river reaches. Adherence to the *MAA*'s water quality objectives was good.

The Committee on Hydrology (COH) continued work on the review of apportionment methods and associated documentation to ensure apportionment monitoring and calculations are accurate. In 2015, two basin reviews were completed and published as PPWB technical reports: Report #172, Basin Review Calculation of Apportionable Flow for the North Saskatchewan River at the Alberta/Saskatchewan Interprovincial Boundary, and Report #173, Basin Review Calculation of Apportionable Flow for the Cold River at the Outlet of Cold Lake.

Evaporation estimates are an important part of apportionment calculation. The COH has a number of initiatives underway to further study evaporation estimation methods.

The Committee on Groundwater (COG) prepared a draft Agreement on Transboundary Aquifers to be added as Schedule F to the *MAA*. A legal review of the proposed agreement by all jurisdictions continues and is expected to be completed in 2017.

The transboundary water quality objectives (WQOs) are descriptions of water quality conditions that are known to protect specific water uses and are acceptable to upstream and downstream provinces. In October 2012, the comprehensive review of the PPWB WQOs was completed. In 2015, the updated water quality objectives were ratified and replace the 1992 objectives.

The Committee on Water Quality (COWQ) has identified that nutrient pollution is a priority and in 2015 began a review of non-point and point sources of nutrient pollution on transboundary river reaches. Golder Associates were awarded the contract and have begun to assess the Carrot River (Saskatchewan-Manitoba boundary) and the Red Deer River (Alberta-Saskatchewan boundary). The work is expected to be completed in March 2017.

In continuing its focus on nutrients, the COWQ is planning a 2 day technical Prairie Water Quality workshop focussing on nutrients and emerging water quality issues in prairie water management. The workshop will be held in Regina, Saskatchewan on October 4-5, 2016.

The Board continued its role in helping to ensure coordination of water management and planning that may have transboundary implications. The Board continued to provide a forum for sharing information, including progress on actions to address Saskatchewan - Manitoba drainage issues, the impacts of sediment transport from the Carrot River on the Saskatchewan River, and drought and flood management in the prairie provinces.

Mike Renouf
Executive Director

SUMMARY OF PERFORMANCE RESULTS

During 2015 - 2016, apportionment responsibilities of the Board were met through:

- Reviewing and approving the apportionment monitoring network comprised of hydrometric and meteorological stations;
- Confirming apportionment obligations were met on Cold Lake, North Saskatchewan River, South Saskatchewan River below the Red Deer River, Battle Creek, Lodge Creek, Middle Creek, Churchill River, Saskatchewan River, Red Deer River (Saskatchewan), Qu'Appelle River, Assiniboine River, and Pipestone Creek;
- Continuing work on the process of reviewing apportionment methods in all basins. Work on the North Saskatchewan River and Cold Lake basin reviews were completed in 2015 and were approved by the Board as PPWB Technical Reports. Basin review on the Saskatchewan River Basin at the Saskatchewan - Manitoba boundary is expected to commence in 2016;
- Developing criteria to document how the PPWB determines which basins are subject to apportionment monitoring; and,
- Continuing with initiatives to further study evaporation estimation methods.

In 2015, water quality objectives were adhered to an average of 96.5%. This adherence rate is based on the comparison of 4,674 water quality results to water quality objectives.

- On June 22, 2015, PPWB Ministers attended a Signing Ceremony and ratified the 2015 interprovincial water quality objectives. The 2015 interprovincial water quality objectives came into effect on July 8, 2015;
- The Committee on Water Quality (COWQ) continued its work of quantifying non-point and point nutrient sources in two river basins, the Carrot River (Saskatchewan - Manitoba boundary) and the Red Deer River (Alberta - Saskatchewan boundary). In July 2015, a contract was awarded to Golder and Associates to begin the assessment on the two watersheds. The investigation is expected to be completed by March 2017;
- In 2015, the COWQ began its planning phase of hosting a Prairie Water Quality Workshop focussing specifically on nutrients and emerging water quality issues in prairie water management. This will be a two day workshop held in Regina, Saskatchewan on October 4-5, 2016;
- The COWQ continued to investigate exceedances of water quality objectives at the transboundary reaches using pesticides as a case study to follow through an “Excursion Response Flow Chart”. A report was finalized and will be publically available in 2016; and,
- The 2016 water quality monitoring program was reviewed and approved by the Board in October 2015.

The Committee on Groundwater (COG) developed a draft Agreement on Transboundary Aquifers to be be added as Schedule F to the *MAA*. A legal review of the draft agreement by all jurisdictions began in 2014 and continued in 2015. The proposed agreement will provide a cooperative framework for managing transboundary aquifers using a Risk Informed Management approach.

The Board determined that there is a need to improve collaboration and communication between jurisdictions concerning flow forecasting and approved the formation of a technical standing committee. The Committee on Flow Forecasting (COFF) had two meetings in 2015 and a work plan has been drafted to guide their work for the next 5 years.

In June 2015 the Board was advised of low flow conditions in the Battle River Basin as a result of drought conditions. In December 2015, the Board was advised that Cold Lake’s water level was being monitored as the lake level had fallen below 534.62 m. Low lake levels were a result of on going drought conditions and regular fall/winter recession. Apportionment requirements were not impacted as a result of drought conditions in 2015.

During the year, the Board discussed the following transboundary issues:

- Water quality in Lake Winnipeg;
- Downstream impacts of drainage in Saskatchewan upon Manitoba;
- Manitoba's concerns related to sediment transport in the Carrot River; and,
- Flood and Drought issues.

The PPWB member governments were informed about PPWB activites through:

- Board and Committee Minutes, Quarterly and Annual Reports, brochures/fact sheets, technical reports, and the PPWB website.

Internal communication was enhanced through regular meetings between Board members and their respective Committee members.

1. INTRODUCTION

This report summarizes the activities of the Prairie Provinces Water Board (PPWB), its Secretariat, and four standing committees that supported PPWB activities for the period April 1, 2015 to March 31, 2016.

The PPWB administers the *Master Agreement on Apportionment (MAA),* signed on October 30, 1969 by Canada and the Provinces of Alberta, Saskatchewan, and Manitoba.

The *MAA* provides for an equitable sharing of available waters for all eastward flowing streams that cross interprovincial boundaries, including transboundary lakes. It also serves to protect transboundary aquifers and surface water quality. Schedules to the *MAA* describe the role of the Board, stipulate how the water shall be apportioned, and set water quality objectives for the water passing from Alberta to Saskatchewan and from Saskatchewan to Manitoba.

The Board consists of three provincial members, representing the Provinces of Alberta, Saskatchewan, and Manitoba and two federal members, representing Environment and Climate Change Canada and Agriculture and Agri-Food Canada.

PPWB activities are jointly funded by the provinces and the federal government, with the provinces each contributing one-sixth and the federal government contributing one-half to the annual budget. The *MAA* assigns the responsibility to monitor water quantity and quality in support of the Agreement to the federal government. Environment and Climate Change Canada conducts this monitoring on behalf of the Government of Canada. The Board approves the annual budget and costed Work Plan.
Section two of this Annual Report presents the performance results for each of the Goals in the Strategic Plan and 2015 - 2016 activities in the Work Plan. Included in this section is Goal 8, which provides a summary of the administration activities and financial expenditures for the year 2015 - 2016.

Appendices provide detailed information on the PPWB. Appendix I illustrates where monitoring is conducted to assess whether jurisdictions have met their requirements in the *MAA.* Appendix II presents 2015 apportionable flow data. Appendices III and IV present the water quality parameters that were monitored by Environment and Climate Change Canada and the 2015 Report on Excursions to Interprovincial Water Quality Objectives. Appendix V provides the organization chart and Appendix VI lists agency representatives on the board and committees. Appendix VII provides the Financial Expenditure Statement. Finally, Appendix VIII describes the history of the PPWB.

2. PERFORMANCE RESULTS

Update

All activities in the 2012 - 2017 PPWB work plans target achieving the eight goals in the PPWB's Strategic Plan. Progress made in 2015 - 2016 is discussed below for each of these goals.

GOAL 1: Agreed Transboundary Apportionment of Water Is Achieved

The PPWB's Strategic Goal 1 is to achieve transboundary apportionment of water as agreed to in the 1969 *MAA*'s Schedule A and Schedule B.

Apportionment Monitoring of Rivers

The *MAA* states that all eastward flowing streams are subject to apportionment. In 2015, the Board conducted apportionment monitoring of Cold Lake, North Saskatchewan River, South Saskatchewan River below the Red Deer River confluence, Battle Creek, Lodge Creek, and Middle Creek on the Alberta - Saskatchewan boundary; and Churchill River, Saskatchewan River, Red Deer River, Qu'Appelle River, Assiniboine River, and Pipestone Creek on the Saskatchewan - Manitoba boundary.

Water Quantity Monitoring

The PPWB is required to assess and report on whether apportionment requirements were met. Environment and Climate Change Canada conducts the water quantity monitoring in accordance with the terms of the *MAA*. In 2015, the PPWB Secretariat calculated apportionable flows using monitoring data from 92 hydrometric stations, 20 meteorological stations and several third party diversion measurements (Appendix I).

Figures 1 and 2 illustrate that all delivery requirements were not met over the entire apportionment period (e.g. Lodge and Middle Creeks). The black bars illustrate the amount of apportionable flows that were required to be delivered by Alberta to Saskatchewan (Figure 1) and by Saskatchewan to Manitoba (Figure 2). The blue and red bars indicate the flow surplus and deficits.

For rivers with surplus flows, the combined black (provincial share) and blue (surplus) stacked bars show the total recorded flows. The red bars indicate deficits. For rivers showing a deficit, the required provincial share is the combined height of the black and red bars. The analysis suggests that large surpluses are fairly common for many of the rivers, and annual flow volumes vary considerably over the years. Because flows vary so much, scientific notation[1] is used on the y-axis to show the magnitude of differences of flows across rivers.

Only two streams have experienced deficits throughout the historical record: Middle and Lodge Creeks. For Middle Creek, five minor deficits were found in 1988, 1989, 1998, 2000, and 2008. Deficits were, however, so small in 1988 and 2000 that they are not obvious in Figure 1. For Lodge Creek, five minor deficits were found in 1988, 1989, 1992, 1998 and 2000. Deficits were also not obvious in Figure 1 in 1992 and 2000. As these creeks are also part of the international agreement between Canada and the United States, Alberta must pass 75% of the flow to Saskatchewan and then Saskatchewan must pass 50% to Montana. This means that any early season use within Alberta puts Alberta at a risk of deficit if the remainder of the year is dry. Alberta and Saskatchewan work cooperatively to address these deficits as they occur and continue to evaluate long-term solutions.

In October 2015, the Board reviewed and approved the monitoring stations lists for 2016-2017. There were a few changes in the monitoring stations listed for the following year with the addition of 5 new meteorological stations and 3 third party hydrometric stations.

[1] The number following the e in the Scientific Notation shows how many zeros should be placed after the decimal place.

Figure 1. Historic River Flows on the Alberta - Saskatchewan Boundary

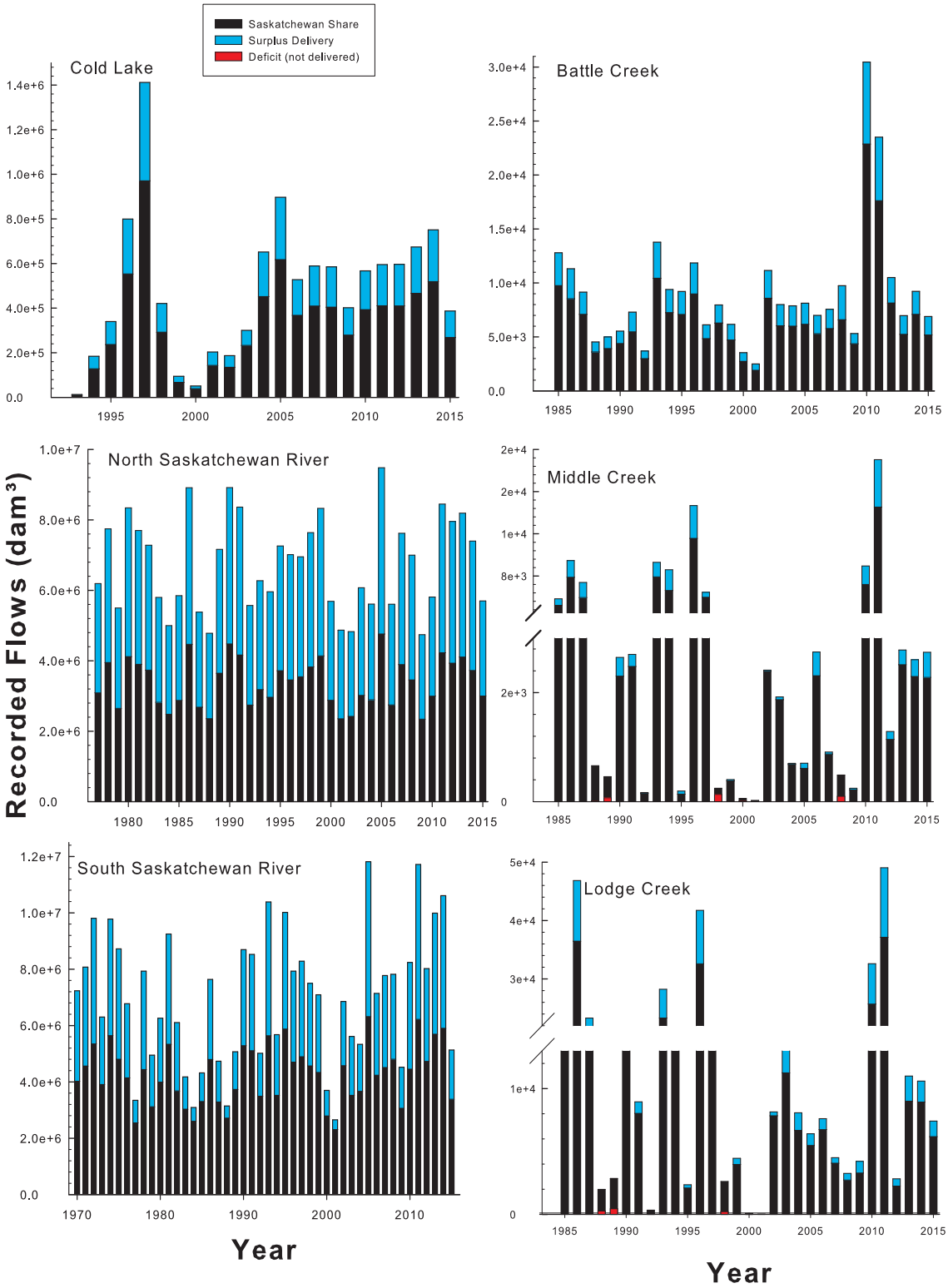
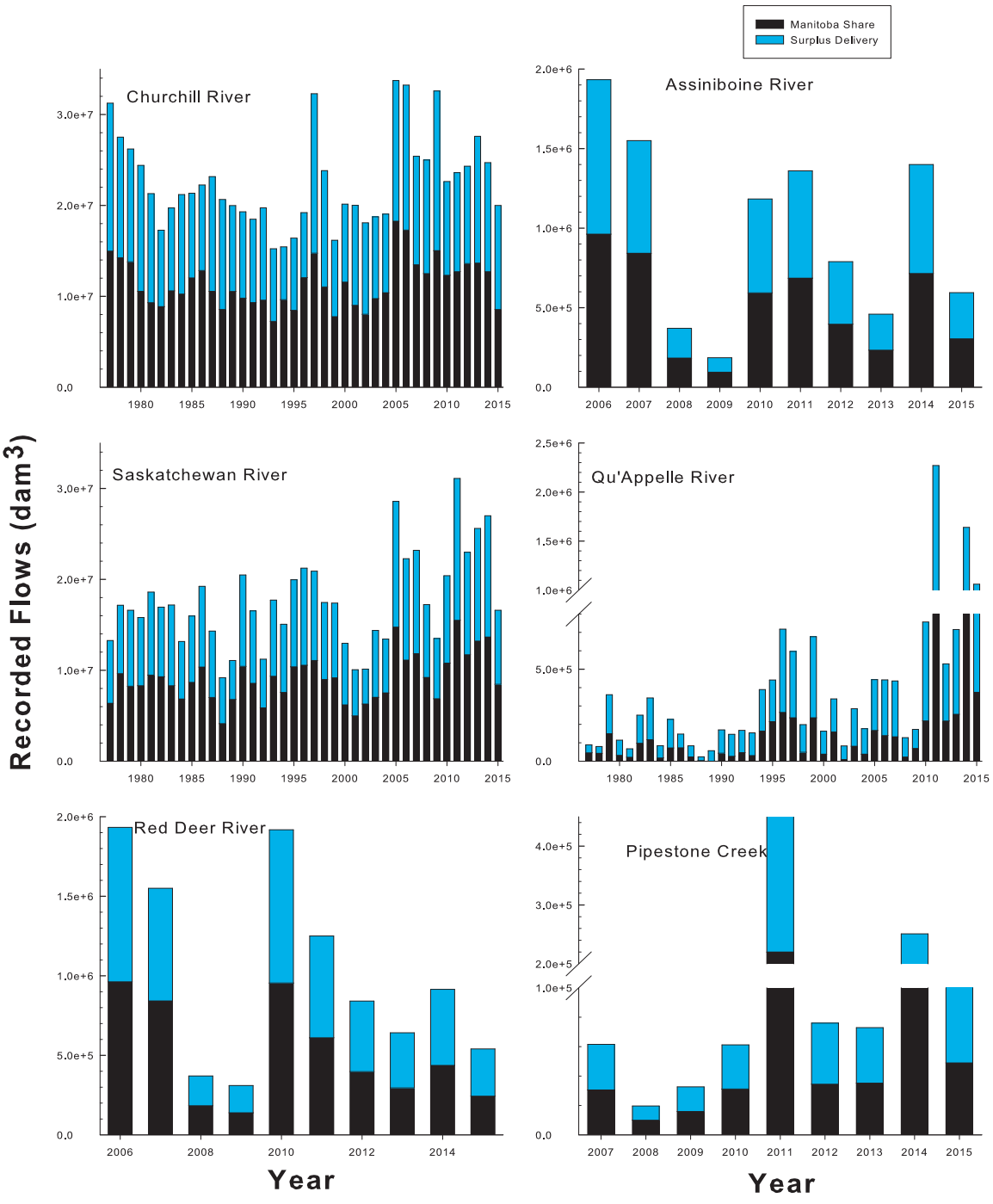


Figure 2. Historic River Flows on the Saskatchewan - Manitoba Boundary



Flows Reported in 2015

Interim flow reporting was completed for four basins in 2015. Quarterly reports presented interim recorded and apportionable flows for the South Saskatchewan River. Monthly and sometimes bi-weekly reports were completed for both Middle and Lodge Creeks from May to October and one semi-annual report from January to June was completed for Cold Lake.

Appendix II presents the final monthly and total apportionment results. All apportionment requirements were met in the 2015 calendar year. For all apportioned rivers and creeks recorded flows were higher than the amounts that Alberta was obligated to deliver to Saskatchewan. The combined daily recorded flows for the South Saskatchewan and Red Deer Rivers at the Alberta - Saskatchewan boundary exceeded the minimum flow requirement of 42.5 m^3/sec (1,500 cfs) at all times in 2015.

Saskatchewan also delivered recorded flows on all rivers and creeks that were higher than the amounts they were obliged to deliver to Manitoba.

Improving Apportionment Methods

Apportionment Procedure Review

The Committee on Hydrology (COH) continued to be engaged in a review of apportionment methods and associated documentation to ensure apportionment monitoring and calculations are accurate.

The work to examine the apportionable flow calculation methods for the 12 interprovincial basins which PPWB actively apportions is expected to take approximately ten years.

The North Saskatchewan River basin was the first basin to undergo this review and was conducted in-house by the PPWB Secretariat. The review was completed in 2015 and a report titled “Basin Review Calculation of Apportionable Flow for the North Saskatchewan River at the Alberta/Saskatchewan Interprovincial Boundary” was approved by the Board in December 2015 as PPWB technical report no. 172. The report provides a number of recommendations including:

- The point of apportionment should be adjusted from the hydrometric monitoring station at Deer Creek, Saskatchewan, to the Alberta/Saskatchewan boundary;
- Consumptive uses other than storage changes in Lake Abraham and Brazeau Reservoir should be included in apportionment flow calculations at the interprovincial boundary;
- Evaporation losses from Lake Abraham and Brazeau Reservoir should be considered as part of the apportionable flow calculations; and,
- New routing equations should be used to adjust for travel time to the apportionment point when accounting for consumptive use, including net depletions at Lake Abraham and Brazeau Reservoir.

In March 2013, the Board indicated its support for contracting external service providers to complete basin reviews, thereby enabling the COH to meet its target review schedule.

The first contract was issued to R. Halliday and Associates Ltd, in October 2014, for the review of the apportionment procedures for Cold River at the Alberta - Saskatchewan boundary. The review was completed in 2015, and a report titled “Basin Review Calculation of Apportionable Flow for the Cold River at the Outlet of Cold Lake” was approved by the Board in December 2015 as PPWB technical report Report no. 173. The report provided the following recommendations:

- Continue performing the apportionable flow calculations as per the methodology that is already in place except for an addition of the monthly water consumption reports from the Canadian Natural Resources Ltd. (CNRL) to the consumption currently considered;
- Maintain the existing monitoring for this basin;
- Adopt the spreadsheet calculations for apportionable flow that was designed by R. Halliday and Associates Ltd;
- Consider an increase in reporting frequency of apportionable flow during conditions of low lake levels; and,
- Consider a drought contingency plan to address the effects of groundwater pumping when lake levels drop below 534.55 m, triggering industrial use of back-up source-groundwater.

The Saskatchewan River Basin, at the Saskatchewan-Manitoba boundary, is currently undergoing an apportionment procedure review. A contract was issued to Optimal Solutions Ltd., and the work is expected to be completed by November 2016.

The next basin to undergo an apportionment procedure review will be the Qu'Appelle River Basin at the Saskatchewan - Manitoba boundary. The process for the Qu'Appelle River basin review will be similar to that of the Cold Lake and Saskatchewan River review as the study is proposed to be completed by a consultant.

Apportionment Monitoring Criteria

A sub-committee of the COH has been formed to develop criteria to document the rationale by which the PPWB determines which basins are subject to apportionment monitoring and the frequency of the monitoring. The sub-committee envisions the criteria could be implemented following the completion of each basin review, as well as for periodic review of basins which are not currently subject to apportionment monitoring.

Modernizing Apportionment Software

The PPWB Secretariat currently uses a suite of FORTRAN programs to compute transboundary apportionable flows. The COH is modernizing this practice through the creation of a customized apportionable flow calculation platform called the River Basin Assessment Tool (RBAT).

Phase I of RBAT was delivered in 2010 and phase II began in December 2012 to enhance certain features of the product such as visual display, ease of use, installation processes, and functionality before the program could be put into use by the PPWB.

The consultant, Optimal Solutions Ltd., provided the final version of RBAT in November 2014. A warranty and help desk portion of the contract continues for a two year period which will end in November 2016. The PPWB Secretariat continued to work on the RBAT implementation, and several issues have been discovered and resolved so far during the software testing phase. The RBAT software was successfully set up and was utilized to calculate apportionable flow for the Red Deer River (Saskatchewan - Manitoba boundary) and the North Saskatchewan River basins in 2015.

Evaporation Investigations

Evaporation estimates are an important part of apportionment calculations used to ensure equitable distribution of water between Alberta, Saskatchewan and Manitoba. The COH has a number of initiatives underway to further study evaporation estimation methods.

The COH has an ongoing interest in improving the lake evaporation estimation methods used in the interprovincial apportionable flow calculations. In 2014, the COH agreed to form an evaporation working group to look at various options to conduct further studies. The working group consists of representative members from each of the jurisdictions as well as the PPWB Secretariat and Meteorological Service of Canada (MSC).

A field study using Newton Lake (Saskatchewan) and Shellmouth Reservoir (Manitoba) is underway to measure evaporation using eddy covariance techniques. This study will provide direct measurement of lake evaporation, which can be used to verify evaporation estimates from various models and calibrate model parameters for optimized results. Results from this study will help better understand lake evaporation in a Canadian prairie environment and improve PPWB apportionment calculations. The study is planned to be carried out over two open water seasons (2016 & 2017), using specialized equipment on loan from Environment and Climate Change Canada's National Hydrology Research Centre. A terms of reference was drafted and a contract was issued to conduct the field study. A PPWB Member Agency is administrating the contract.

GOAL 2: Transboundary Groundwater Aquifers Are Protected and Used in a Sustainable Manner

The PPWB's Strategic Goal 2 protects groundwater quantity and quality and sustainable use of transboundary aquifers.

The *MAA* currently has a general statement to refer any transboundary groundwater issues to the Board for their review and recommendation. No issues or concerns were identified in 2015 - 2016.

Groundwater Schedule F

Development and Consultation

In October 2007, the Board directed the Committee on Groundwater (COG) to focus on the development of an agreement on transboundary aquifers to include as a schedule for groundwater in the *MAA.*

The COG prepared a draft "Agreement on Transboundary Aquifers" to be added as Schedule F to the *MAA*. The objectives of the Agreement are to promote:

- Effective and efficient management of transboundary aquifers;
- Sustainable use and equitable sharing of transboundary aquifers; and,
- Protection and preservation of transboundary aquifers and associated aquatic environments.

An internal legal review of the proposed Schedule F began in 2014 and is progressing.

Implementation

A Risk Informed Management (RIM) approach is proposed to be used to cooperatively manage transboundary aquifers. The RIM is intended to be an Annex to Schedule F.

RIM Scenarios

The proposed RIM will be used to assess the risks to and vulnerability of transboundary aquifers, and use the assessment to classify each transboundary aquifer into risk categories. In December 2015, the PPWB directed the COG to develop scenarios that will demonstrate the response to various groundwater situations under the RIM and flowchart process. The COG has developed three case studies to test, modify and validate the RIM process.

Environmental Scan and Transboundary Risk Assessment Criteria

The last environmental scan was conducted in 2011 and focussed exclusively on aquifers which are potential sources of potable water. The PPWB, at their Meeting No. 111 held in November 2014, directed the COG to conduct an updated environmental scan of transboundary aquifers. The COG is working toward developing an evaluation criteria and an improved risk analysis process for assessing transboundary aquifers that will support the RIM approach. The assessment criteria will be used to classify provincial transboundary aquifers into risk categories. The risk classification will be used by the PPWB to determine and prioritize appropriate bilateral, multilateral, and jurisdictional actions for the management of transboundary aquifers.

Cold Lake Drought Contingency Plan

Groundwater pumping may affect lake levels of Cold Lake and apportionable flow delivered to Saskatchewan from Alberta. This could become a significant concern to the PPWB. One of the recommendations from PPWB technical report no. 173, Basin Review Calculation of Apportionable Flow for the Cold River at the Outlet of Cold Lake, was the need to develop a drought contingency plan to address potential effects of groundwater pumping during times of drought on Cold Lake. The idea of the plan would be to gain an understanding of linkage between surface and groundwater in the Cold Lake basin.

Voluntary Provisions of Transboundary Withdrawals

Provincial COG members have contacted their respective water rights offices to inform them of the need to report groundwater projects with significant withdrawals to the neighbouring province.

The COG is also looking at a formalized system for tracking of voluntary information and notification to adjacent jurisdictions of projects with potential transboundary impacts to support the implementation of Schedule F.

Goal 3: Agreed Transboundary *MAA* Water Quality Objectives Are Achieved

The PPWB's Strategic Goal 3 is to achieve agreed transboundary water quality objectives that are included in Schedule E of the *MAA* for a number of key watercourses at the Alberta-Saskatchewan and Saskatchewan-Manitoba boundaries.

Water Quality Monitoring

The *MAA*'s water quality monitoring locations are shown in Appendix I. The MAA's water quality monitoring parameters are shown in Appendix III.

In 2015, new water quality objectives were implemented. Changes to the water quality objectives include the addition of seasonal nutrient objectives for each of the 12 transboundary rivers and the inclusion of new water quality objectives on Cold River. Water quality monitoring in 2015 reflect these changes.

A rotational strategy for the sampling of pesticides was developed and implemented in 2006. Sampling of pesticides was switched to rotational sampling at sites with a long data record and where most data points were low. Two or three of these sites are sampled each year providing a five year return frequency for most PPWB stations. The Carrot and Assiniboine rivers are sampled every year because they are agricultural watersheds and pesticide detections occur frequently.

In 2015, in accordance with the terms of the *MAA*, Environment and Climate Change Canada conducted water quality monitoring at 12 sites as requested by the PPWB. The water quality monitoring program for 2015 included:

- Nutrients, physicals, major ions/Sodium Absorption Ratio (SAR), metals and bacterial parameters – four samples on the Churchill River and 12 samples (monthly) at all other sites;
- For all pesticide parameters (acid herbicides, neutral herbicides, organo-chlorines and glyphosate):
  - 12 samples on the Carrot River and Assiniboine River;
  - 8 samples on the Battle River and the Red Deer River (Alberta / Saskatchewan boundary);
- Additional acid herbicide sampling began in 2013 on the South Saskatchewan River and the Battle River. In 2015, the monitoring plan continued sampling for acid herbicide on the South Saskatchewan River. The Battle River will be sampled on a rotational basis; and,
- Additional acid herbicide sampling was conducted on the Qu'Appelle River and the Saskatchewan River due to higher detections of these pesticides on these two rivers.

The 2015 monitoring program was completed as approved by the Board at their October 9, 2014, Meeting No. 110, with some exceptions due to metering equipment problems for pH and dissolved oxygen (DO) during the September sampling event on the Battle, Beaver, Cold, and North Saskatchewan rivers. DO was not measured in December on the Red Deer River at the Alberta-Saskatchewan boundary, again due to field meter problems. Environment and Climate Change Canada undertook a total of 134 water sampling events in 2015. Details of the 2015 water quality monitoring field program can be found in the PPWB Report on Excursions of Interprovincial Water Quality Objectives, January-December 2015, in Appendix IV.

New Interprovincial Water Quality Objectives Come Into Effect in 2015

In June 2015, the PPWB Ministers approved the 71 interprovincial water quality objectives on 12 transboundary river reaches and, on July 8, 2015, the new interprovincial water quality objectives came into effect. The objectives are guidelines that the Board uses to determine whether the water in a particular river is acceptable for a broad range of uses. The new objectives replace the 1992 water quality objectives.

The new approved objectives will better position the Board to make informed decisions on water quality management at all PPWB sites for all water uses. The objectives include nutrient objectives on the Alberta - Saskatchewan boundary for the first time, update the objectives for total phosphorus (TP) on the Saskatchewan - Manitoba boundary

and add total nitrogen (TN) and total dissolved phosphorus (TDP) objectives. These objectives are set as site specific objectives based on a statistical approach using the historical data record and are seasonal objectives. The new objectives have also incorporated a larger number of pesticide objectives and increased the number of metal objectives.

Adherence or Excursions to Transboundary Water Quality Objectives

The *MAA* established water quality objectives for individual parameters based on values that protect aquatic life, source water, recreation, agriculture uses and fish consumption.

A total of 4,674 water quality samples were compared to the transboundary water quality objectives to determine whether any excursions to the objectives occurred in 2015. The Committee on Water Quality (COWQ) has been developing an action plan to assess the risks and causes of excursions and the potential to mitigate by the respective jurisdictions.
The PPWB report on Excursions of Interprovincial Water Quality Objectives January to December 2015 is shown in Appendix IV. This report was recommended by the COWQ and approved by the Board in November 2016.

In 2015, the transboundary water quality objectives were adhered to an average of 96.5% of total samples. Overall, adherence rates from 2015 are similar to those from previous years. Because this is the first year the new 2015 water quality objectives have been applied, rates were calculated retroactively for 2003 through 2015 with the new water quality objectives. This allows for comparison of adherence rates from 2015 with previous years.

The adherence rate ranged from 100% (Churchill River) to 94.9% (Red Deer River, Alberta - Saskatchewan boundary), indicating that water quality was suitable for the majority of the intended water uses for these rivers. Most rivers show little variation in adherence rates. The Battle and the Red Deer (Alberta - Saskatchewan boundary) rivers show the greatest variability in adherence rate over the years.

Of the 12 transboundary rivers, Red Deer River (Alberta - Saskatchewan boundary) had the lowest adherence rate to the new water quality objectives as a result of excursions in nutrients, metals, major ions, bacteria, and total suspended solids (TSS). The Red Deer River also had the largest variance in adherence rates when the historical data from the last 13 years was compared to the new 2015 water quality objectives. The COWQ is compiling available information on the Red Deer River in order to determine whether further investigations should be recommended.

Variations in adherence rates can occur naturally and can be influenced by a number of factors including climate variability, flow, sediment loading, groundwater and point or non-point inputs into the river.

Quantifying Non-Point and Point Nutrient Sources in Interprovincial Watersheds

The COWQ determined that nutrients are a priority for further investigation across the prairie provinces due to increasing trends in some river reaches and exceedances of water quality objectives. Nutrients are also key to the overall water quality protection of rivers. To begin this investigation the COWQ proposed to assess nutrients on two prairie watersheds, the Red Deer River at the Alberta - Saskatchewan boundary and the Carrot River at the Saskatchewan - Manitoba boundary. The objective of the nutrient review work is to identify point and non-point sources of nutrients and to look at hotspots in both river basins.

In February 2015, the Board indicated its support for contracting external service providers to quantify both non-point and point nutrient sources in interprovincial watersheds. In July 2015, a contract was awarded to Golder and Associates, the successful bidder through a competitive process. In 2015, the consultant began the data gathering phase of the investigation. The contract is expected to be completed in March 2017.

Case Response to Excursions

In 2013-2014, the COWQ considered how to priorize potential investigations of exceedances of water quality objectives at the transboundary reaches. An "Excursion Response Flow Chart" was developed to provide a process to assess excursions to water quality objectives and to determine potential follow up actions. The COWQ determined that pesticides would be used as a case study to follow through the Excursion Response Flow Chart. The review uses pesticide data from 2011 and compares it to the updated 2015 water quality objectives. The focus of the review is to understand pesticide excursion frequency and associated patterns so that examining excursions in years other than 2011 provides context of excursion rates.

A report based on the review was finalized and approved as a PPWB technical report in February 2016. The report concludes that there were frequent occurrences of pesticides within the acid herbicide group that exceeded the interprovincial water quality objectives. The regular and frequent exceedance of these acid herbicides provides sufficient evidence to warrant further examination of pesticides in transboundary rivers. The report makes a number of recommendations:

- The Board should notify each of their respective jurisdictions about the regular occurrence of acid herbicide excursions to the interprovincial water quality objectives;
- The Board should request feedback from provincial jurisdictions (Alberta, Saskatchewan and Manitoba) in regard to their awareness of the pesticide concern;
- The Board should request any additional pesticide data and potential impacts from Alberta, Saskatchewan, and Manitoba to expand the current data set and increase insight on pesticide prevalence in surface water on the prairies; and,
- The Board should request an increase in pesticide monitoring for the acid herbicide group and increase this from rotational to annual monitoring for selected rivers.

As a result of the findings of the report, in 2015, Environment and Climate Change Canada increased acid herbicide monitoring at the request of the PPWB on the South Saskatchewan, Saskatchewan and the Qu'Appelle rivers.

The Board will need to determine how to address the recommendations of the report. The report is expected to be available to the public in 2016.

Fish Tissue Report and Fish Monitoring Program

The COWQ has drafted a fish tissue report based on PPWB historical data from 1992 to 2004. The committee determined that the report should be reviewed and revised, where needed, by a fish biologist. A small contract will be issued for this purpose in 2016.

The Fish Tissue Program was once active but has been suspended for a number of years to ensure the program is meeting the needs of the Board and to verify if the sampling program is in need of revision. In January 2015, the committee expressed a continued interest in monitoring the transport of mercury in interprovincial streams, however noted that monitoring the transport of mercury by fish sampling at the boundaries is not helpful and a more targeted approach is necessary. The COWQ continues to investigate alternative approaches including the potential for a sediment/macro-invertebrate sampling program to monitor mercury. The committee is investigating the logistics of this type of program.

Dissolved Oxygen Monitoring

The committee determined that dissolved oxygen (DO) was a parameter that required further review on low flow rivers such as the Battle, Beaver and the Carrot rivers. As part of a pilot study, Environment and Climate Change Canada installed DO loggers in the three rivers. The committee has added biological oxygen demand to the monitoring program for these three rivers and is looking for

field measurement of ice depth, snow cover and river depth. The concentration of DO is near zero in these three river systems during the ice covered winter months. The committee is exploring work on setting winter DO objectives on these rivers. This study is ongoing and will be used in preparation for the next water quality objectives review.

Water Quality Workshop

Workshops are an important part of enabling the Board to fulfill its mandate by providing the means to share information, knowledge and research among jurisdictions. In 2014, the COWQ discussed hosting a Prairie Water Quality workshop that would focus primarily on nutrients with a session on emerging chemicals in the environment. The intent of the workshop is to provide a technical forum and technical learning opportunity. The workshop is scheduled to take place on October 4-5, 2016 in Regina, Saskatchewan.

GOAL 4: Governments Are Informed About Emergency and Unusual Water Conditions

The PPWB's Strategic Goal 4 is to inform jurisdictions of emergency and unusual water conditions, facilitating effective and cooperative transboundary water management.

PPWB Contingency Plan

The PPWB Interprovincial Event Contingency Plan is an effective method of informing government agencies of spills or unusual water quality conditions as well as emergency or unusual surface water quantity or groundwater quantity and quality events in transboundary basins.

The PPWB Event Contingency Plan is not meant to replace any jurisdictional emergency spill response mechanism. The Contingency Plan includes information on: area of coverage, responsibilities, pattern of response and organizational structure. The Contingency Plan also ensures that proper communication approaches within each jurisdiction are addressed and that the Board will discuss the effectiveness of this communication on a regular basis.

The Event Contingency Plan currently involves a "how to" guide to inform jurisdictions. An Event Notification Report Form is used to inform PPWB and Committee members, providing them sufficient information to investigate whether adequate mitigation efforts are being taken to avoid impacts to neighbouring jurisdictions.

Drought Conditions in the Prairies

Drought was the most significant climate related risk in the prairies in 2015-2016.

Alberta underwent some of the most intense drought conditions. Spring runoff was complete as early as March/early April in some areas and low flows were experienced through much of the province during the summer because of below normal precipitation during spring and summer. Alberta took measures by implementing water management objectives that are in place for the South Saskatchewan, the Battle and the North Saskatchewan River basins, the areas most affected by the drought conditions, by restricting temporary diversion licenses. Alberta also closely monitored Cold Lake water levels in late fall 2015 as a result of lake level drops. Low lake levels were a result of on-going drought conditions, along with regular fall/winter recession. Alberta is developing more general provincial water shortage procedures as a result of the drought conditions experienced in 2015-2016.

In Saskatchewan in 2015-2016, spring and early summer precipitation were well below normal across much of the province, although the province received above normal late summer and fall precipitation in east central areas of the province. In January 2016, there was a near complete loss of snow pack over areas south of the South Saskatchewan River in southwestern Saskatchewan. Lake Diefenbaker, a reservoir in southern Saskatchewan, was formed by the construction of Gardiner Dam and Qu'Appelle River Dam to store and control flows in the South Saskatchewan River. Lake Diefenbaker was maintained slightly above median levels in order to manage for drought conditions.

Drought also affected parts of Manitoba in 2015-2016, specifically the east in the early summer and the western part of the province toward the end of the summer. Stream flows were above normal for most of the major rivers in 2015-2016, with the exception of the Churchill River basin which experienced moderate to extremely dry conditions, and the Saskatchewan River which experienced low flows during the summer months. In order to help manage drought in Manitoba, the government released its new Drought Management Strategy in January 2016. This initiative was developed to provide a formal, clear, science based and coordinated process to increase Manitoba's resiliency to drought and to minimize the impact of further droughts.

GOAL 5: Transboundary Water Issues Are Addressed Cooperatively to Avoid Disputes

The PPWB's Strategic Goal 5 is to avoid conflicts and disagreements over transboundary water issues. During the year, the PPWB discussed issues related to several existing projects of interest to different jurisdictions.

Lake Winnipeg Nutrient Issues

Lake Winnipeg is Canada's sixth-largest freshwater lake, and is fed by a vast international basin covering 960,000 square km, extending over four provinces and four states. Concern over nutrient loading in Lake Winnipeg has risen in recent years, with reports of increased frequency, duration, and intensity of algal blooms. The Province of Manitoba, Environment and Climate Change Canada and many other partners have been engaged in several large initiatives to address water quality issues in Lake Winnipeg.

The PPWB provides a forum to exchange information on Lake Winnipeg initiatives with the Provinces of Saskatchewan and Alberta. Canada and Manitoba signed a Memorandum of Understanding (MOU) in September 2010 to continue their collaborative partnership into the long-term. In May 2015, a Ministerial exchange of letters was completed to extend the Canada-Manitoba MOU for another five years to September 2020.

The goal of this agreement is to establish a long-term collaborative and coordinated approach between two governments to support the sustainability of Lake Winnipeg and its contribution to economic activities, recreation and watershed functions. Specific goals are to coordinate science, information sharing and any activities to further the MOU.

The Steering Committee met in May and in December 2015. The Board was informed about activities of Environment and Climate Change Canada's Lake Winnipeg Basin Initiative (LWBI). The LWBI focuses on three areas: transboundary partnerships to manage nutrients in the basin; scientific research, modelling and monitoring; and a stewardship fund for stakeholder-led projects that reduce nutrient loads into the lake and basin.

The LWBI is nearing its final year of a five year funding cycle. As per the mandate letter from the Minister of Environment and Climate Change, a priority has been identified to renew the government's commitment to protect the Lake Winnipeg Basin and those considerations are underway.

The Board was also kept informed of Manitoba's actions to reduce nutrient loading. Manitoba is working in partnership with Environment and Climate Change Canada and the International Red River Board (IRRB). The IRRB is continuing its preparation of a basin-wide nutrient management strategy and is compiling information on how each jurisdiction is addressing nutrient issues. The development of the Red River nutrient objectives will be coordinated with developing nutrient objectives for Lake Winnipeg.

Carrot River Sediment Concerns

Saskatchewan, with the support of Manitoba, continues to explore opportunities to investigate the reduction of channel capacity in the Saskatchewan River near The Pas, Manitoba, as a result of sediment transport from the Carrot River. Terms of Reference for this project were finalized in 2014. Manitoba and Saskatchewan are discussing the path forward in this initiative.

Saskatchewan/Manitoba MOU Respecting Water Management

In October 2015, an MOU was signed between Saskatchewan and Manitoba to facilitate a cooperative and coordinated approach to mitigate flooding and drought and to protect and improve water quality and aquatic ecosystem health. The intent of the MOU is not to duplicate efforts but to make use of existing mechanisms for coordination and cooperation when dealing with water management. The MOU acknowledges the important work of the PPWB and agrees to work through the PPWB where it is the appropriate existing mechanism.

Saskatchewan / Manitoba Drainage

Both Saskatchewan and Manitoba have introduced long term water management strategies to deal with drainage issues. Saskatchewan has created a 25 Year Water Security Plan which includes the creation of new drainage regulations to address drainage issues. Regulatory changes were implemented in September 2015 and are the first significant change to drainage regulations in 35 years. More information on the new drainage regulations can be found at: www.wsask.ca/Water-Programs/Agricultural-Drainage-/.

Under Manitoba's Surface Water Management Strategy, a new regulatory approach for drainage and water retention is underway. The proposed change will adjust the focus of the regulation from minor drainage changes to those with a major impact on downstream owners or on the environment. The proposed changes will improve protection of Lake Winnipeg by ensuring that more wetlands are protected. More information on Manitoba's Surface Water Management Strategy can be found at: www.gov.mb.ca/sd/waterstewardship/questionnaires/surface_water_management/.

GOAL 6: Ministers, Senior Managers and Appropriate Staff of Governments Are Informed About PPWB Activities

The PPWB's Strategic Goal 6 is to keep jurisdictions informed about PPWB activities. This transparency ensures that cost-shared activities are delivered efficiently and effectively and are consistent with the mandate of the PPWB.

The PPWB member governments were informed about PPWB activities through various means, including the ongoing distribution of Board and Committee Minutes and Quarterly and Annual Reports, as well as through brochures and fact sheets, technical reports, and the PPWB website. The PPWB website (www.ppwb.ca) exists to inform the public and interested parties of PPWB activities, and provide a means for Member governments to exchange information and facilitate the business of the PPWB. The PPWB website provides access to a complete suite of PPWB publications and fact sheets. A member portal also facilitates the exchange of information.

PPWB Ministers met in June 2015, in Winnipeg, Manitoba, to ratify the 2015 Water Quality Objectives. The 2015 Water Quality Objectives came into effect on July 8, 2015. The Board used this opportunity to provide PPWB Ministers with an update on other PPWB activities such as the proposed Agreement on Transboundary Aquifers (Schedule F) and the proposed Risk Informed Management (RIM) approach.

GOAL 7: Information, Knowledge and Research Are Shared Among Governments

The PPWB provides a forum to foster effective and cooperative water management on the Prairies. Goal 7 facilitates cooperation by exchanging information and knowledge amongst jurisdictions and participating in research projects of mutual interest and relevance to the PPWB mandate.

Committee on Flow Forecasting

In 2014, the Board determined that the formation of a standing Committee on Flow Forecasting (COFF) would improve collaboration, coordination and communication between jurisdictions concerning flow forecasting. In 2015, the COFF was officially formed with a mandate to investigate, oversee, review, report and improve the accuracy of flow forecasting at interprovincial boundaries. The committee may consider inter-jurisdictional flow forecasting methods, basin forecasting models (hydraulic and hydrologic), tools and techniques, communications, provision and transmission of data, studies and other items of interest involving streamflow forecasting.

The Terms of Reference was approved by the Board in November 2015. The committee has representation from the Governments of Canada, Alberta, Saskatchewan and Manitoba. A five year workplan has been developed and it will be incorporated into the PPWB's 2016-2021 workplan.

The primary focus of the COFF's first five year workplan is to improve data sharing and information exchange. Some of the specific workplan items include: coordinated mapping of spring runoff potential, improved data sharing, improving collaboration/communication with Meteorological Service of Canada, information exchange on modelling initiatives, exploring the need for enhanced soil moisture measurements throughout the prairie provinces, conducting a flow forecasting workshop and performing visits and tours of forecasting offices.

Invasive Species

The PPWB member agencies continue to share information and knowledge on their invasive species programs and legislation. In June 2015, the Government of Canada's Department of Fisheries and Oceans announced the publication of new "*Aquatic Invasive Species Regulations*". The new regulations are expected to help prevent the introduction, spread and establishment of aquatic invasive species in Canada. Asian carp, Quagga mussels (*Dreissena bugensis*) and Zebra mussels (*Dreissera polymorpha*) are some examples of species targeted by the new regulations.

In June 2015, a large number of zebra mussel veligers were found in samples taken at the Manitoba-North Dakota border at Emerson and in samples collected within and just north of the City of Winnipeg, Manitoba. In 2014, Manitoba enhanced its legislation related to aquatic invasive species. The Aquatic Invasive Species Bill was introduced in the Legislature in December 2014 and is thought to be the most comprehensive legislation in North America addressing the threat of aquatic invasive species.

Alberta allocated resources for monitoring and inspection of watercrafts under the Aquatic Invasive Species Prevention Program. Watercraft inspections are now mandatory for detection and prevention of zebra and quagga mussels. In addition, mussel detecting canines were introduced in June 2015 as a permanent part of Alberta's prevention program.

Saskatchewan began and tested a pilot veliger detection program in 2014. In 2015, the program continued and was expanded to include an Adult Invasive Mussels Monitoring (AIMM) program. The AIMM is a voluntary program that has been implemented on multiple waters with the help of many Watershed Associations, the Saskatchewan Wildlife Federation, Resort Villages and Parks.

Invasive species has become a regular item for discussion at the Board's spring and fall meetings.

GOAL 8: PPWB Business is Conducted Effectively

The PPWB's Strategic Goal 8 focuses primarily on administration, work planning, and financial management. Goal 8 ensures that work planning and budgeting is consistent amongst jurisdictions, day to day activities are administered effectively, there is effective communications, and succession planning is done to ensure continuity of Board, Committee and Secretariat functions.

ADMINISTRATIVE AND FINANCIAL MANAGEMENT

As illustrated by the organization chart in Appendix V, the Board operates through its Executive Director and four technical Standing Committees (Committee on Hydrology, Committee on Groundwater, Committee on Water Quality and Committee on Flow Forecasting). The Committee on Flow Forecasting is a new committee formed in 2015. The Board consists of senior officials engaged in the administration of water resources in the Provinces of Alberta, Saskatchewan, and Manitoba and senior officials from Environment and Climate Change Canada and Agriculture and Agri-Food Canada (Appendix VI). Committee members are managers and technical experts within each member agency. The Board is chaired by the Environment and Climate Change Canada member. The Committees are chaired by the Executive Director.

Secretariat support is provided to the PPWB through the Transboundary Waters Unit, Environment and Climate Change Canada, Regina, Saskatchewan. The portion of time each Secretariat staff person spends on PPWB activities is charged to the PPWB and cost-shared by the members. In addition, technical support is provided, as required, by other staff of the Government of Canada and the three Prairie Provinces.

Five Board and eight Committee meetings were held throughout the 2015 - 2016 fiscal year. The Board invites the various Committee members to participate in Board meetings. This practice is common with all of the Board Committees, thereby improving communication and understanding between the Board and the Committees.

PPWB

- Meeting No. 114. October 23, 2015 - Teleconference
- Meeting No. 115 Part A. November 2-3, 2015 - Edmonton
- Meeting No. 115 Part B. November 6, 2015 - Teleconference
- Meeting No. 115 Part C. December 4, 2015 - Teleconference
- Meeting No. 116 Part A. February 9-10, 2016 - Regina

COH

- Meeting No. 131. September 15-16, 2015 - Edmonton
- Meeting No. 132. January 27-28, 2016 - Winnipeg

COWQ

- Meeting No. 128. September 17-18, 2015 - Edmonton
- Meeting No. 129. February 2-3, 2016 - Winnipeg

COG

- Meeting No. 68. October 9, 2015 - Teleconference
- Meeting No. 69. January 26, 2016 - Teleconference

COFF

- Meeting No. 1. December 16, 2015 - Teleconference
- Meeting No. 2. February 11-12, 2016 - Regina

The Board approves the annual budget for the PPWB. The budget for 2015 - 2016 was $976,632 and final expenditures were $706,812 as shown in Appendix VII. Final expenditures were below the approved budget due to delays in initiating the contracting process for the basin review project and vacancies in the Secretariat in 2015-2016.

The Board conducts budget planning early in the year and has a substantial discussion on the budget at the fall meetings. This discussion facilitates early input by the Board into the budget processes of the PPWB member governments.

The PPWB Work Plan is a standing item on regular Board meeting agendas in order to review items that are discussed which are derived from the Work Plan. The PPWB Work Plan has been expanded and renewed for the next five years and encompasses the years 2015-2016 to 2020-2021. The renewed five-year work plan is reviewed annually, and provides direction until March 2021.

The purpose of the work plan is to:

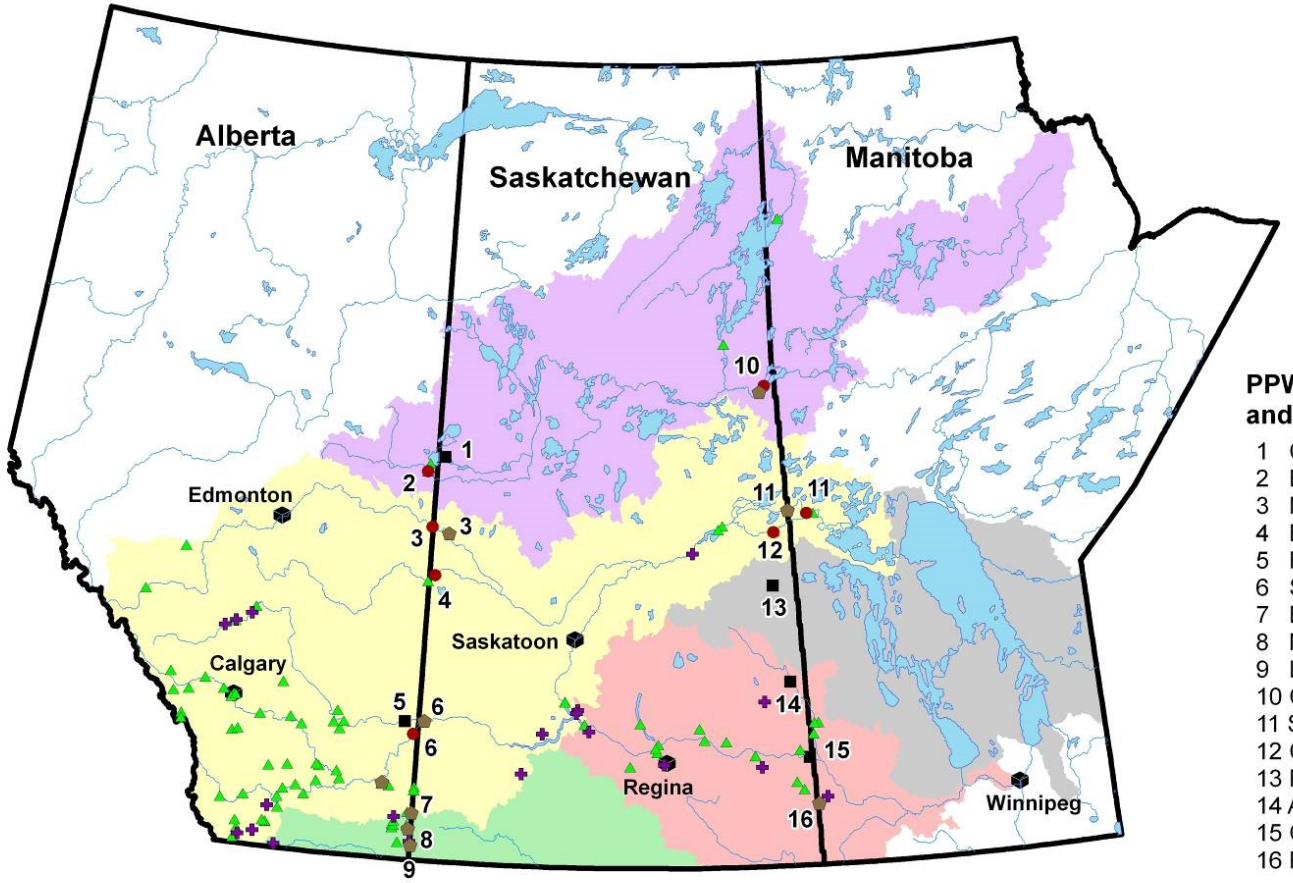
- position the Board to anticipate and plan for future work priorities and resource requirements;
- guide the Board in its work over 5 years, ensuring that activities target fulfilling the Goals in the PPWB Strategic Plan;
- feed into multi-year work plans for the four Standing Committees and the Secretariat; and
- provide the foundation for communication with Ministers and senior officials within each government.

Renewal and Modernizing of PPWB Documents

In order to modernize, enhance, streamline and avoid duplication, the Board reviews PPWB documents periodically. The Board began their review of PPWB documents in 2014 - 2015. This will be a multi year task and the Board expects to complete the review in the next couple of years.

Further information on the history and administration of the PPWB can be found in Appendix VIII.

APPENDIX I: PPWB Monitoring Stations for 2015 - 2016



PPWB Apportionment and Water Quality Sites

1 Cold River
2 Beaver River
3 North Saskatchewan River
4 Battle River
5 Red Deer River A/S
6 South Saskatchewan River
7 Battle Creek
8 Middle Creek
9 Lodge Creek
10 Churchill River
11 Saskatchewan River
12 Carrot River
13 Red Deer River S/M
14 Assiniboine River
15 Qu'Appelle River
16 Pipestone Creek

Basins

- Assiniboine River
- Churchill River
- Lake Winnipeg
- Missouri River
- Saskatchewan River

Type of Monitoring

- Hydrometric
- Meteorological
- Quality
- Apportionment
- Apportionment and Quality

APPENDIX II: 2015 Recorded and Apportionable Flows

APPENDIX IIA: Flows at the Alberta - Saskatchewan Boundary (in Cubic Decametres)

SOUTH SASKATCHEWAN RIVER - ALBERTA - SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	250000	298000	486000	452000	312000	565000	176000	229000	340000	369000	258000	193000	3930000
CONSUMPTIVE USE	2300	1900	1900	71200	415000	538000	434000	243000	114000	1600	2600	2900	1830000
CHANGE IN RESERVOIR STORAGE	-67600	-52800	-42600	-33700	30400	197000	-52500	-113000	-59400	5900	-12700	11000	-190000
INTERBASIN TRANSFER*	0	0	0	3000	12600	19400	19000	20700	18500	9800	0	0	103000
APPORTIONABLE FLOW	176000	254000	435000	445000	685000	1330000	632000	425000	413000	400000	258000	195000	5640000

* Irrigation diversions to the Eastern and Western Irrigation Districts which are subsequently returned to the Red Deer River.

RED DEER RIVER - ALBERTA - SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	38000	47000	220000	205000	91000	70000	84000	99000	133000	111000	60000	36000	1190000
CONSUMPTIVE USE	0	0	0	0	0	4000	4000	5000	2000	0	0	0	10000
CHANGE IN RESERVOIR STORAGE	-20000	-23100	-7100	-33000	17400	57000	19000	15000	0	-100	-5100	-17800	2000
INTERBASIN TRANSFER**	0	0	0	-3000	-12600	-19400	-19000	-20700	-18500	-9800	0	0	-103000
APPORTIONABLE FLOW	17800	24300	210000	170000	80400	116000	93700	99700	117000	101000	58300	19900	1110000

** Irrigation return flow from the Eastern and Western Irrigation Districts.

SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	288000	345000	706000	657000	403000	635000	260000	328000	473000	481000	318000	228000	5120000
APPORTIONABLE FLOW	194000	278000	645000	615000	765000	1440000	726000	525000	5300000	501000	316000	215000	6750000
SASKATCHEWAN SHARE (50%)	97000	139000	323000	308000	383000	721000	363000	262000	265000	250000	158000	107000	3380000
EXCESS (+) OR DEFICIT (-) DELIVERY	191000	206000	383000	350000	20000	-86200	-103000	65700	208000	230000	160000	121000	1750000
CUMULATIVE EXCESS OR DEFICIT	191000	397000	780000	1130000	1150000	1060000	960000	1030000	1230000	1460000	1620000	1750000	1750000

Recorded flow was 76% of the apportionable flow. Alberta is required to deliver 50% of the apportionable flow to Saskatchewan. Alberta is also required to deliver to Saskatchewan flows not less than 42.5 m^3/s below the confluence with the Red Deer River. Alberta met the minimum flow requirement in 2015. Apportionment of flow in the South Saskatchewan River is specified in Article 4, Schedule A of the *MAA*. Apportionable flow calculations are based on the methodology described in the report entitled "South Saskatchewan River Below Red Deer River - Natural Flow", April 1985 (PPWB Report No. 45). Flows have been routed and, as a result, the values presented in the table cannot be exactly balanced on a monthly basis. Final numbers might differ due to rounding to three significant figures.

NORTH SASKATCHEWAN RIVER - ALBERTA - SASKATCHEWAN BOUNDARY (NEAR DEER CREEK)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	351000	351000	661000	850000	518000	552000	428000	383000	394000	409000	407000	394000	5700000
APPORTIONABLE FLOW	129000	132000	435000	654000	558000	936000	900000	709000	633000	469000	275000	171000	6000000

Recorded flow was 95% of apportionable flow. Computation of apportionable flow in 2015 reflects the implementation of recommendations made in PPWB report no. 172; "Basin Review Calculation of Apportionable Flow for the North Saskatchewan River at the Alberta-Saskatchewan Interprovincial Boundary". Alberta is required to deliver 50% of the apportionable flow to Saskatchewan.

BATTLE CREEK - ALBERTA - SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	0	622	2240	1110	673	434	438	354	505	514	0	0	6890
APPORTIONABLE FLOW	0	622	2240	1110	679	439	438	354	505	508	0	0	6900

Recorded flow was close to 100% of the apportionable flow. Alberta is required to deliver 75% of the apportionable flow to Saskatchewan.

LODGE CREEK - ALBERTA - SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	0	444	6180	706	87	3	0	0	0	1	0	0	7420
APPORTIONABLE FLOW	0	515	6600	857	218	45	0	0	0	1	0	0	8240

Recorded flow was 90% of the apportionable flow. Alberta is required to deliver 75% of the apportionable flow to Saskatchewan.

MIDDLE CREEK - ALBERTA - SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	0	0	2370	185	61	42	22	20	24	20	0	0	2740
APPORTIONABLE FLOW	0	0	2750	133	61	20	22	18	21	11	0	0	3040

Recorded flow was 90% of the apportionable flow. Alberta is required to deliver 75% of the apportionable flow to Saskatchewan.

COLD LAKE - ALBERTA - SASKATCHEWAN BOUNDARY (AT OUTLET OF COLD LAKE)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	37700	34900	37000	43100	47300	43500	38100	31400	23700	20300	17100	12900	387000
APPORTIONABLE FLOW	38000	35200	37400	43600	47800	44000	38700	31900	24100	20800	17500	13300	392000

Recorded flow was 99% of the apportionable flow. Computation of apportionable flow in 2015 reflects the implementation of recommendations made in PPWB report No. 173; "Basin Review Calculation of Apportionable Flow for the Cold River at the Outlet of Cold Lake". Alberta is required to deliver 68.4% of the apportionable flow to Saskatchewan.

APPENDIX IIB: Flows at the Saskatchewan - Manitoba Boundary (in Cubic Decametres)

CHURCHILL RIVER - SASKATCHEWAN - MANITOBA BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
ESTIMATED FLOW	1860000	1680000	1870000	1820000	1720000	1690000	1700000	1700000	1560000	1530000	1420000	1440000	20000000
APPORTIONABLE FLOW	1700000	1420000	1530000	1530000	1720000	1450000	1510000	1460000	1280000	1230000	1120000	1120000	17100000

Estimated flow includes recorded flow at Sandy Bay, SK and estimated inflow from Sandy Bay to the Saskatchewan-Manitoba Boundary. Estimated flow was 117% of the apportionable flow. Estimated flow exceeded the apportionable flow in 2015 due to a reduction in reservoir storage of 2 930 000 dam^3 in Reindeer Lake. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

SASKATCHEWAN RIVER - SASKATCHEWAN - MANITOBA BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
ESTIMATED FLOW	1180000	1160000	1550000	3080000	1970000	1190000	929000	1060000	1050000	1180000	1150000	1080000	16600000
APPORTIONABLE FLOW	829000	816000	1540000	3440000	2000000	1520000	1090000	1190000	1300000	1440000	1020000	700000	16900000

Estimated flow at the Saskatchewan-Manitoba boundary is calculated using recorded flow of the Saskatchewan River at The Pas minus 1.31 times the recorded flow of the Carrot River near Turnberry. Estimated flow was 98% of the apportionable flow. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

QU'APPELLE RIVER - SASKATCHEWAN - MANITOBA BOUNDARY (NEAR WELBY)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	44400	34400	95900	262000	188000	108000	80000	68000	59400	47500	40300	31600	1060000
APPORTIONABLE FLOW													749000

Recorded flow was 141% of the apportionable flow. Recorded flow exceeded the apportionable flow by 311 000 dam^3 in 2015 due to the proceedural inaccuracies for determining apportionable flow for the Qu'Appelle River. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

RED DEER RIVER - SASKATCHEWAN - MANITOBA BOUNDARY (NEAR ERWOOD)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	3480	3630	20800	153400	98600	16900	14100	99100	40700	27900	33200	28100	540000
APPORTIONABLE FLOW	3140	3270	18600	141000	89300	14000	12000	89000	36600	25100	29900	25300	487000

Recorded flow was 111% of the apportionable flow due to the contribution of agricultural drainage to the flow of the Red Deer River. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

ASSINIBOINE RIVER - SASKATCHEWAN - MANITOBA BOUNDARY (AT KAMSACK)

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	6830	6310	39600	314000	105000	21300	15700	20200	15600	15600	21000	13300	594000
APPORTIONABLE FLOW	6870	6340	40100	323000	107000	22200	16300	20900	16000	15700	20900	13300	609000

Recorded Flow was 98% of the apportionable flow. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

PIPESTONE CREEK - SASKATCHEWAN - MANITOBA BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	1980	1570	35600	41100	14600	4560	934	337	1180	1300	1230	1230	106000
APPORTIONABLE FLOW	1890	1480	38400	37400	10100	2240	889	327	1120	1370	1300	1260	97800

Recorded flow was 108% of the apportionable flow. Recorded flow exceeded apportionable flow in 2015 due to the pumping of 8 000 dam^3 of water from Kipling Marsh into Pipestone Lake. Saskatchewan is required to deliver 50% of the apportionable flow to Manitoba.

APPENDIX III: PPWB Water Quality Monitoring 2015 Parameter List

Water is collected monthly at all sites with the exception of the Churchill River (4x/yr)

ALKALINITY, phenol & total
ALUMINUM, diss. & total θ
AMMONIA, total.θ
ANTIMONY, diss. & total
ARSENIC, diss. θ & total
BARIUM, diss. & total θ
BERYLLIUM, diss. & total
BICARBONATE, calc.
BISMUTH, diss. & total
BORON, diss. θ & total
CADMIUM, diss. & total θ
CALCIUM, diss.
CARBON, diss. organic
CARBON, part. organic
CARBON, total organic, calcd.
CARBONATE, calcd.
CHLORIDE, diss.θ
CHROMIUM, diss. & total θ
COBALT, diss. & total θ
COLIFORMS FECAL θ
COLOUR TRUE
COPPER, diss. & total θ
E. COLI
FLUORIDE, diss. θ
FREE CO_2, calcd.
GALLIUM, diss. & total
HARDNESS NON-CARB. (CALCD.)
HARDNESS TOTAL (CALCD.) CACO3
IRON, diss. θ & total
LANTHANUM, diss. & total
LEAD, diss. & total θ
LITHIUM, diss. & total
MAGNESIUM, diss.
MANGANESE, diss. θ & total
MOLYBDENUM, diss. & total
NICKEL diss. & total θ
NITROGEN NO_3 & NO_2, diss.θ
NITROGEN. part.
NITROGEN, total calcd.
NITROGEN, diss.
OXYGEN, diss.θ
pH θ
PHOSPHOROUS ortho, diss.
PHOSPHOROUS, part. calcd.
PHOSPHOROUS, total θ
PHOSPHOROUS, diss.
POTASSIUM, diss.
RESIDUE FIXED NONFILTRABLE
RESIDUE NONFILTRABLE
RUBIDIUM, diss. & total
SELENIUM, diss. θ & total
SILVER, diss. & total
SILICA,
SODIUM ADSORPTION RATIO, calcd.θ
SODIUM, diss.θ
SODIUM PERCENTAGE, calcd.
SPECIFIC CONDUCTANCE
STRONTIUM, diss. & total
SULPHATE, diss.θ
TEMPERATURE WATER
THALLIUM, diss. & total
TOTAL DISSOLVED SOLIDS, calcd.θ
TURBIDITY
URANIUM, diss. & total θ
VANADIUM, diss. & total θ
ZINC diss. & total θ

ACID HERBICIDES*θ♦
NEUTRAL HERBICIDES*
ORGANOCHLORINE INSECTICIDES*

θ Parameters with PPWB site-specific objectives
* Collected from the Battle, Red Deer (AB/SK), Carrot and Assiniboine Rivers in 2015
♦ Collected from the South Saskatchewan River in 2015

APPENDIX IV: PPWB REPORT ON EXCURSIONS OF INTERPROVINCIAL WATER QUALITY OBJECTIVES

JANUARY - DECEMBER 2015

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

SUMMARY

This 2015 report fulfils requirements of the Master Agreement on Apportionment (MAA) to report on the protection of water quality for major interprovincial prairie rivers. During 2015, water quality samples were collected on 12 major inter-provincial rivers. The water quality results were compared to water quality objectives for each site. In general, water quality was suitable for the intended water uses for the rivers with few excursions of the objectives. Based on the evaluation of excursions in 2015 and with consideration of results from previous excursion reports, trend analysis, and on-going work by the Committee on Water Quality (COWQ), the following are recommended:

- There is a need to better understand the processes affecting nutrient concentrations in rivers with frequent excursions and increasing trends. Nutrients should be considered a priority area for investigation because increasing levels of nutrients can lead to more eutrophic waters, which can affect ecosystem function. The Committee's on-going work to understand sources and trends in nutrients will continue in 2016.

- There are frequent pesticide excursions, notably MCPA and dicamba, at several transboundary rivers. The COWQ recommends that the acid herbicides in the South Saskatchewan and Qu'Appelle rivers be monitored annually to better understand the inter-annual variability and seasonal pattern of pesticide concentration at these sites. The COWQ also recommends working with the jurisdictions to better understand the potential effects to the aquatic environment and users of these waters.

- Exceedences in metals at several sites appear to be related to peaks in flow and suspended solids. Trends in metal concentrations and relationships to physical parameters, including flow and suspended solids, should be examined for select rivers to gain further understanding on whether these factors influence metal concentrations in transboundary rivers.

- Overall, in comparison to the other sites, the Red Deer River (near Bindloss) had the lowest adherence rate to the newly implemented water quality objectives (due to excursions in nutrients, metals, major ions, bacteria, and TSS) in 2015. The Red Deer River also had the largest variance in adherence rates when the historical data from the last 13 years was compared to the new 2015 water quality objectives. In response to the excursions the Committee will compile available information on the Red Deer River and will make recommendations on whether further investigation is warranted.

INTRODUCTION

The governments of Alberta, Saskatchewan, Manitoba and Canada entered into the Master Agreement on Apportionment (*MAA*) in 1969. Schedule E, agreement on water quality, was added to the Agreement in 1992. The Agreement is administered by the Prairie Provinces Water Board (PPWB) who has a mandate to foster and facilitate interprovincial water quality management among the parties to encourage the protection and restoration of the aquatic environment. One of the processes the PPWB uses to meet this mandate is this annual report on adherences to the interprovincial water quality objectives. If, as a result of human activity, chemical, biological or physical variables do not meet acceptable limits then the appropriate jurisdiction has agreed to undertake reasonable and practical measures to ensure the quality of the water in that river reach is within acceptable limits (*MAA* Schedule E, 1992).

Schedule E requires the PPWB to monitor the quality of the aquatic environment and make annual comparisons with established interprovincial water quality objectives. Water quality objectives have been established at 12 major interprovincial eastward flowing river reaches (Appendix 1). The water quality objectives were reviewed and updated in 2015, and are designed to protect water uses including the protection of aquatic life, source water, recreation, agricultural uses (livestock watering and irrigation) and fish consumption. The Alberta-Saskatchewan and Saskatchewan-Manitoba boundaries each have six river sites (Figure 1).

Water quality monitoring includes a range of physical, chemical and biological parameters at one site in each of the river reaches. These include nutrients, major ions, metals, fecal coliforms, physical characteristics and pesticides. This report presents adherences of the 2015 water quality data to the 2015 interprovincial water quality objectives.

Field Program - summary of (2015) sampling

Environment and Climate Change Canada undertook a total of 134 water sampling events at the 12 PPWB river sites in 2015. The monitoring program for 2015 was completed, as approved by the Board (Appendix 2), with the following exceptions: pH and dissolved oxygen were not monitored in the field on the Alberta-Saskatchewan boundary in September for the Battle, Beaver, Cold, and North Saskatchewan rivers due to metering equipment problems. Dissolved oxygen was also not measured in December for the Red Deer River (AB/SK) due to field meter problems.

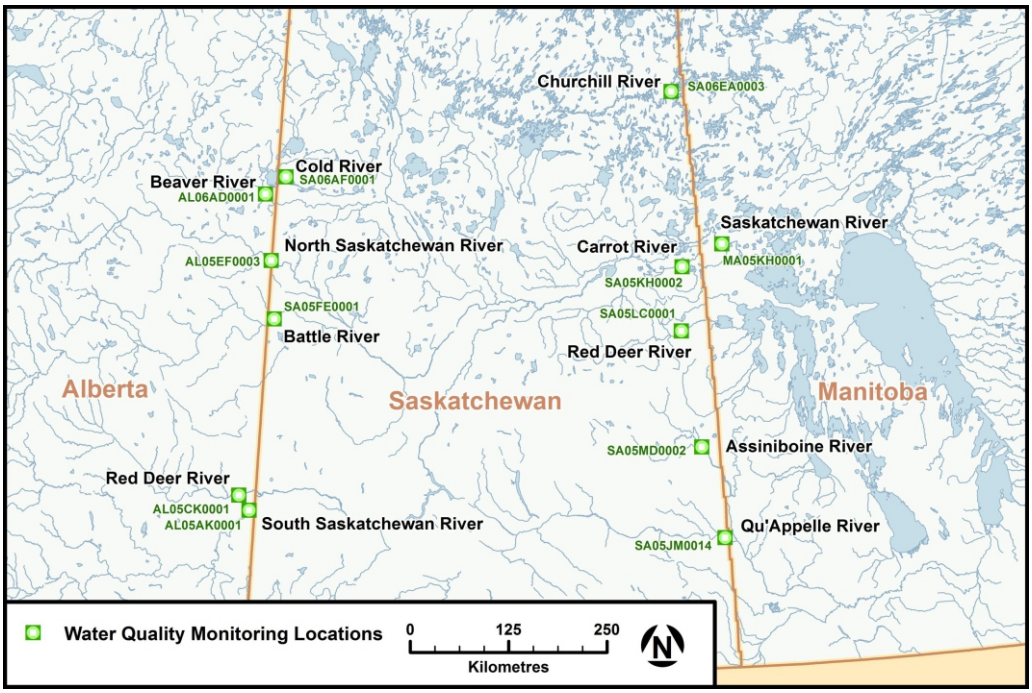


Figure 1 **Map showing location of PPWB water quality monitoring stations**

Table 1 **PPWB Water Quality Station Information**

River	Station Number	Latitude	Longitude	Hydrometric Site(s)
Alberta - Saskatchewan				
Battle	SA05FE0001	52° 56' 25.008"	109° 52' 23.988"	05FE004
Beaver	AL06AD0001	54° 21' 15.012"	110° 12' 42.984"	06AD006
Cold	SA06AF0001	54° 34' 00.000"	109° 50' 10.000"	06AF001
North Saskatchewan	AL05EF0003	53° 36' 05.004"	110° 00' 29.988"	05EF001
Red Deer (Bindloss)	AL05CK0001	50° 54' 10.008"	110° 17' 48.984"	05CK004
South Saskatchewan	AL05AK0001	50° 44' 15.000"	110° 05' 44.016"	05AJ001*
Saskatchewan - Manitoba				
Assiniboine	SA05MD0002	51° 31' 59.016"	101° 53' 20.004"	05MD004
Carrot	SA05KH0002	53° 36' 00.000"	102° 07' 00.012"	05KH007
Churchill	SA06EA0003	55° 36' 29.016"	102° 11' 44.016"	06EA002**
Qu'Appelle	SA05JM0014	50° 29' 02.004"	101° 32' 35.016"	05JM001
Red Deer (Erwood)	SA05LC0001	52° 52' 00.012"	102° 10' 59.016"	05LC001
Saskatchewan	MA05KH0001	53° 50' 30.012"	101° 20' 03.984"	05KJ001 ***

* Estimated flow for the PPWB South Saskatchewan site is based on recorded flow at Medicine Hat plus the flow from Seven Person Creek and Ross Creek with a two day lag

** Estimated flow for PPWB Churchill site includes recorded flow at Sandy Bay and estimated inflow from Sandy Bay to the border.

***Estimated flow for PPWB Saskatchewan site includes recorded flow at 05KJ001 minus the adjusted flow at the Carrot River 05KH007

RESULTS

Overall Adherence to Interprovincial Water Quality Objectives

The overall adherence rate to the interprovincial water quality objectives was, on average, 96.5% in 2015 (Figure 2). This adherence rate is based on the comparison of 4,674 water quality results to water quality objectives.

Overall adherence rates from 2015 are similar to those from previous years (Figure 3). While this is the first year that the new 2015 water quality objectives have been applied to the Prairie Provinces Water Board river reaches, adherence rates were calculated retroactively for 2003 through 2014 with the new water quality objectives. This analysis allows for comparison of adherence rates for 2015 with previous years using the same 2015 water quality objectives.

Most rivers show little variation in adherence rates among years (approximately 5%). The Battle and Red Deer (AB/SK) rivers had the greatest variability in adherence rate among years. For the Battle River this variability is due to high and low adherence rates in 2006 and 2003, respectively. The lower adherence rate in 2003 is in part due to more excursions of major ions. For the Red Deer (AB/SK) high and low adherence rates were observed in 2004 and 2005, respectively. The lower adherence rate in 2005 was not specifically attributable to a single variable or one group of variables. From 2014 to 2015 ten rivers showed an increase in the overall adherence rate ranging from 0.21% on the Carrot River to 4% on the Churchill River. Two rivers, the North Saskatchewan River and the Cold River, showed a slight decrease in overall adherence rate (1.6 and 0.42% respectively) from 2014 to 2015.

The 2015 adherence rate for each river was similar to the twelve year median adherence rate for the respective river (all within 2.6%, with nine sites within less than 1%). There are no acute water quality concerns apparent from review of the overall adherence rate values for 2015.

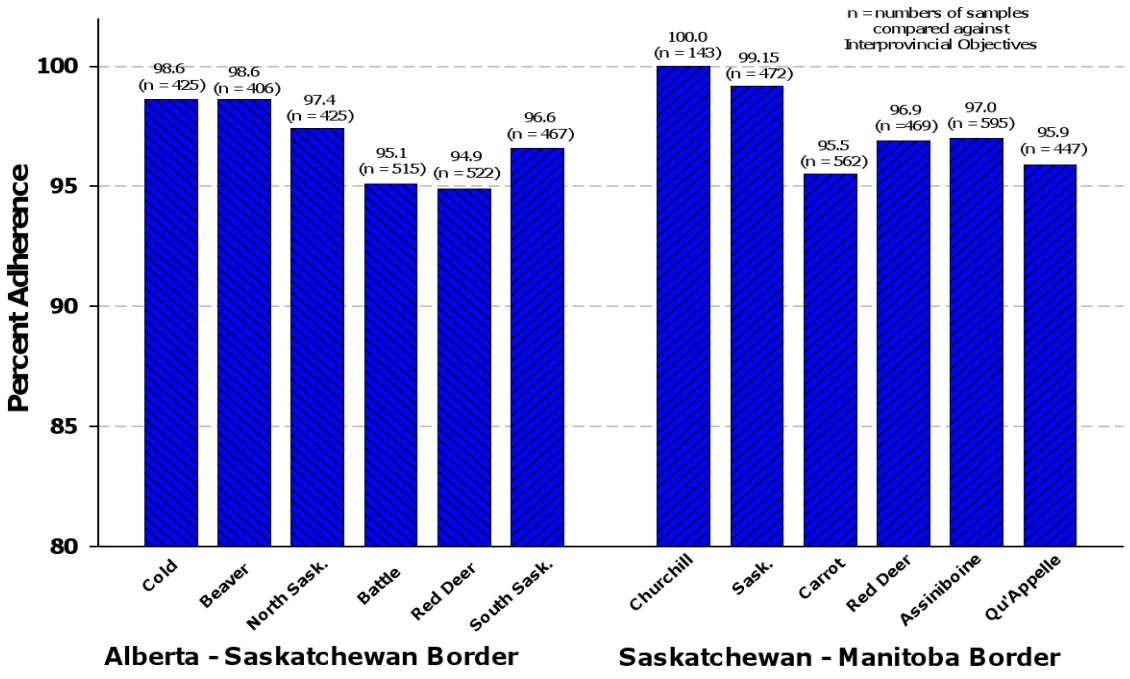


Figure 2 **Percent Adherence to 2015 Interprovincial Water Quality Objectives in 2015 (n=total number of comparisons per site**

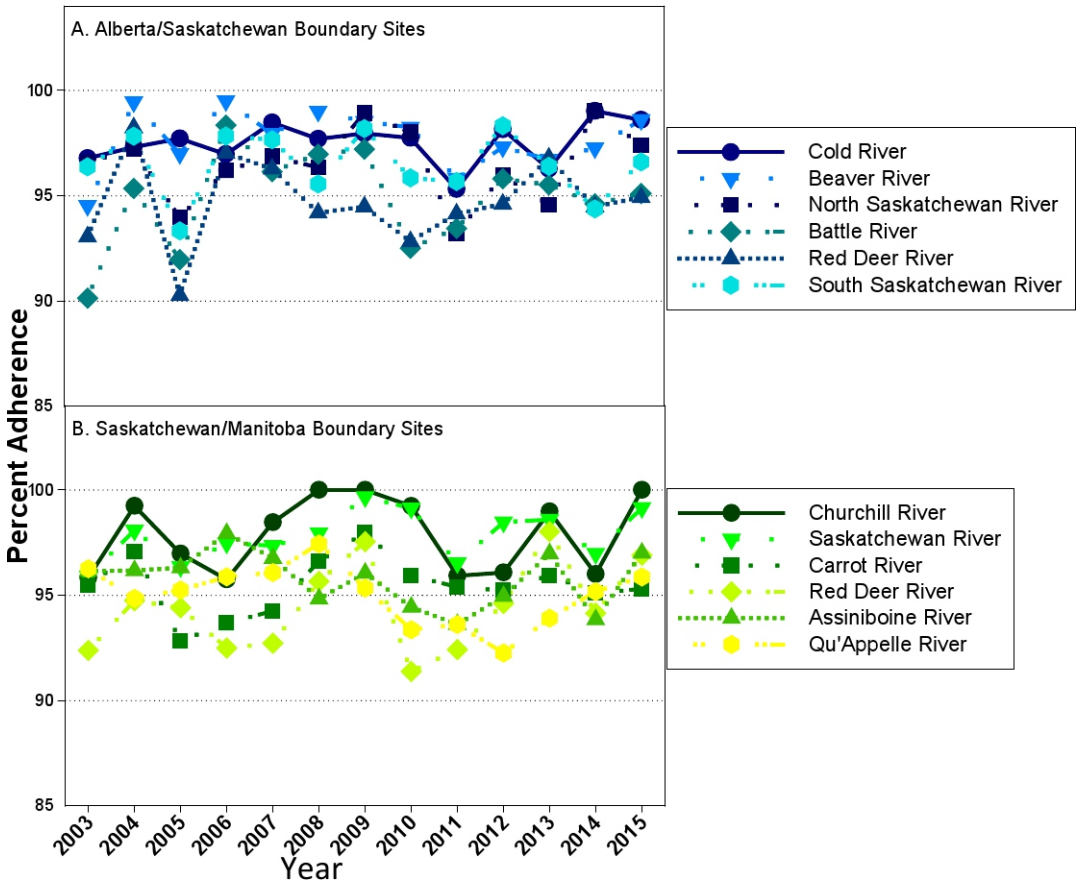


Figure 3 **Percent adherences to interprovincial water quality objectives for A) the Alberta - Saskatchewan and B) the Saskatchewan - Manitoba boundaries from 2003 to 2015**

Examination of Specific Parameter Excursions for 2015

Alberta - Saskatchewan Boundary

For the Alberta-Saskatchewan boundary rivers, there were excursions of nutrients (total phosphorus (TP), total nitrogen (TN), and total dissolved phosphorus (TDP)), metals (arsenic, cadmium, copper, iron, lead, manganese, selenium, silver and zinc), major ions (fluoride, sodium, sulphate and total dissolved solids (TDS)), bacteria (fecal coliforms or *Escherichia coli* (*E. coli*) and total suspended solids (TSS) (Tables 3, 5, 7 and 9).

Flow has an influential effect on water quality and is therefore important to consider when understanding inter- and intra-annual changes in water quality. Total suspended sediment is a measure of sediment and particulate matter in the water column. It is not unexpected to see elevated levels of nutrients, total metals and coliform bacteria associated with elevated TSS concentrations.

Elevated TSS concentrations are typical during spring runoff and other episodic events such as high flows following summer storms. Total suspended solids in the water column may be due to a variety of causes such as erosion of soil and river banks and re-suspension of bottom sediments.

Site-specific nutrient objectives were established for TP, TDP and TN using a statistical approach that

evaluated the long-term data from each site. It is expected that there will be a certain proportion of excursions over the long term. Typically these are more frequent in some years and less frequent in other years. There were a number of nutrient excursions on multiple rivers at the Alberta-Saskatchewan boundary in 2015 (Tables 3, 7). Nutrient objectives for TP, TDP and TN are based on seasonal background concentrations. The Red Deer River (AB/SK) had the most number of total and nutrient excursions of all the Alberta-Saskatchewan transboundary river sites in 2015. The Red Deer River had TP excursions in the spring, summer and fall in 2015 (March, August, September and November), while TDP excursions occurred in the early part of the year and throughout the spring. Total nitrogen excursions for this river also occurred in March and September. In September, there was significant increased flow and a corresponding spike in TSS. However, during spring freshet there was no TSS spike associated with increased flows. The committee has initiated further work on the Red Deer River (AB/SK), as part of a pilot study, to further investigate sources of nutrients and identify whether there are sub-watersheds that more strongly influence downstream nutrient concentrations. The Battle River also had a higher number of excursions of the TP and TDP objectives in each of the open and closed water seasons. Total phosphorus is the one nutrient on this river that was found to have an increasing trend over time. Peak flow on the Battle River occurred in April and coincided with a peak in TSS. Often, nutrient concentrations increase during high-flows with the movement of sediment through the riverine system. The South Saskatchewan River also had excursions of all three nutrients. While increases in flow cannot explain all of the excursions observed on this river in 2015, peaks in nutrients, TSS and flow co-occur in June 2015.

Nine metals (arsenic, cadmium, copper, iron, lead, manganese, selenium, silver and zinc) exceeded water quality objectives on the Alberta-Saskatchewan transboundary rivers in 2015. All six rivers showed at least one exceedance to a metal objective. The objective is for the total metal with the exception of iron and manganese which are in the dissolved form. Of note was the Red Deer River (AB/SK), which exceeded water quality objectives for seven metals. The exceedances occurred in August and September and coincided with elevated TSS level which also exceeded its water quality objective. The Red Deer River also showed a small peak in flow in September (Table 2, Figure 4). The Battle River also showed five excursions to the metals objectives, again related to high TSS and peak flows in April. In general, comparatively higher concentrations of total metals, as compared to dissolved forms, are observed in prairie rivers during high flow events when total suspended solids are elevated.

Sodium, sulphate and TDS exceeded the water quality objectives in the Battle River during late winter. These exceedances are likely a result of low flows in the Battle River in late winter under ice conditions. The lowest TDS values for this river were observed following ice break-up and spring freshet in April. Total dissolved solids were also elevated on the Red Deer River in December under ice conditions with low flow conditions.

Fluoride was the other major ion that exceeded site-specific water quality objectives in 2015 in each of the South Saskatchewan River (in March, May and August) and the North Saskatchewan River (in March). The COWQ will follow up to assess the potential for human-derived fluoride to be affecting levels in rivers.

There were four river sites where the density of fecal coliform bacteria exceeded the water quality objective in 2015 - the Battle, Beaver, North Saskatchewan and Red Deer rivers. Sources of fecal coliform are numerous and include wildlife and pet waste, discharge of wastewater, and runoff from agricultural activities including livestock operations and agricultural fields that apply animal waste products. Occasional exceedances of fecal coliform objectives are not unexpected in surface waters, particularly in response to rainfall events that can transport fecal bacteria through runoff. In the case of the Battle, Beaver and North Saskatchewan River, the detection of bacteria did not appear to be related to any significant increase in TSS or peak flow, but could have been a small local event. All bacteria detections with the exception of the February sample on the North

Table 2 **Water Quality Results for the Red Deer River (near Bindloss) for August and September 2015**

PARAMETER	UNIT	OBJECTIVE	12-AUG-15	09-SEP-15
ARSENIC TOTAL	µg/L	5	7.41	5.57
IRON DISSOLVED	µg/L	300	2210	108
LEAD TOTAL*	µg/L	3.99 | 6.19	45.4	17.4
MANGANESE DISSOLVED	µg/L	50	67.3	4.81
SELENIUM TOTAL	µg/L	1	1.07	0.64
SILVER TOTAL	µg/L	0.1	0.37	0.135
ZINC TOTAL	µg/L	30	200	81.1
TOTAL SUSPENDED SOLIDS	mg/L	30.0 – 832.6	3270	1010
TURBIDITY	NTU	No Objective	3332	990
AVERAGE DAILY FLOW	m^3/s	---	33.7	68.2

*Lead is a calculated objective based on total hardness

Saskatchewan River occurred during the open water season. *E. coli*, is also a measure of fecal contamination in water supplies and is often the preferred indicator over fecal coliform bacteria. In 2015, *E. coli* exceeded the water quality objectives once on the North Saskatchewan River and twice on the Red Deer River. The *E. coli* excursion on the North Saskatchewan River occurred in February, while the two excursions on the Red Deer River occurred in August and September.

Pesticides were measured on the Battle, Red Deer and South Saskatchewan rivers in 2015. Excursions occurred for two herbicides (2-methyl-4-chlorophenoxyacetic acid (MCPA) and dicamba) in the South Saskatchewan River (Table 5). MCPA and dicamba are commonly used across the prairie provinces. For the South Saskatchewan River, MCPA exceeded the irrigation objective in June which corresponded to peak water inflows into this river and dicamba exceeded the water quality objective in July, 2015. A review of recent pesticide data for the Alberta-Saskatchewan rivers (2006 to 2011) showed that these herbicides are often detected at low concentrations in water samples and frequently exceed the PPWB water quality objectives. MCPA exceedances of the PPWB objective have ranged from 0 to 30% since 2006 and dicamba has ranged from 20 to 50% in the years the South Saskatchewan River has been monitored for pesticides. The committee will continue to do follow-up work with the jurisdictions on the presence of these pesticides in the transboundary river systems.

Glyphosate is a nonselective systemic herbicide that is used extensively throughout the prairies. The PPWB does not currently have a numerical objective for glyphosate, but given its extensive use throughout the prairies has chosen to report detections of this herbicide. In 2015, glyphosate was monitored on the Battle and Red Deer rivers. For each of these rivers glyphosate was detectable at very low levels in all eight water samples collected throughout the year. The highest levels occurred in April during freshet.

There are relatively few excursions for the Cold River (total cadmium and total suspended solids) (Tables 3). Five observed excursions for this river were a result of low TSS concentrations which resulted in not meeting the lower TSS objective.

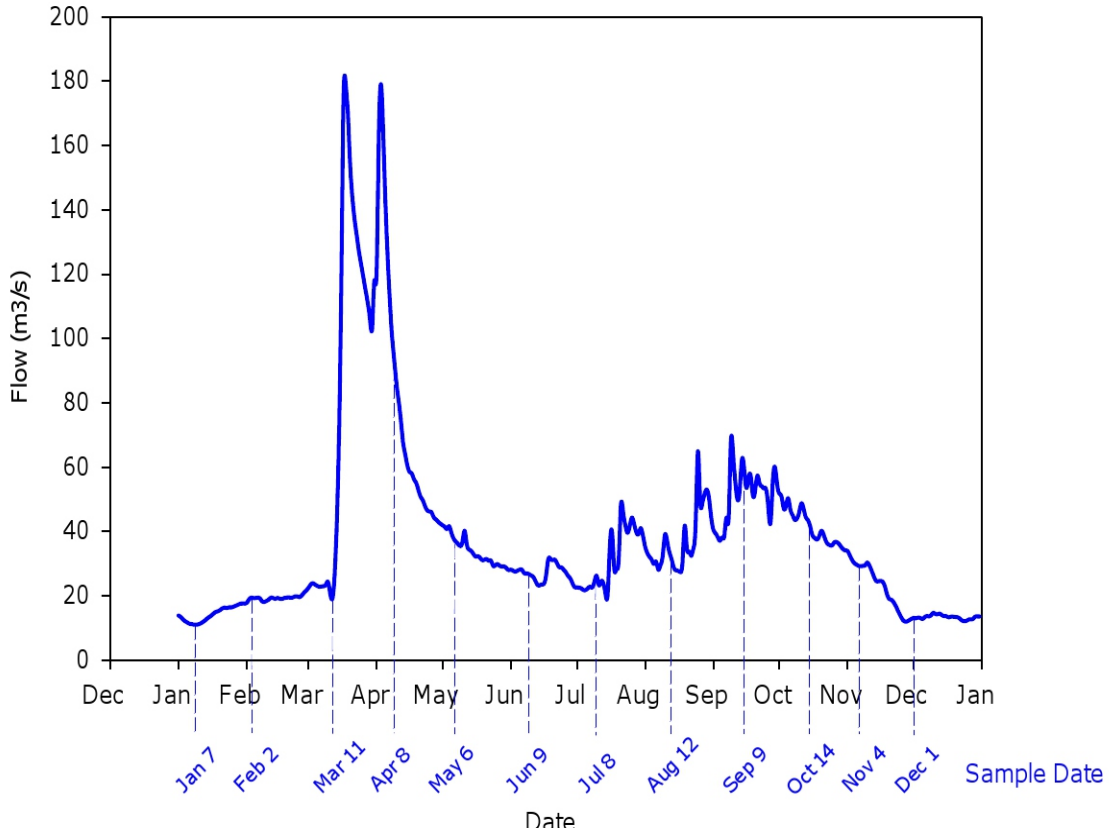


Figure 4 **Red Deer River (near Bindloss) Daily Flow for 2015**

These low concentrations of TSS are not unexpected given it is the outflow from Cold Lake.

Cold Lake is a substantial deep-water lake and it has a moderating effect on the water quality of the outlet. For example, the lowest median concentrations and lowest range of variability for TSS, nutrients, and total dissolved solids is observed in the Cold River as compared to the other Alberta-Saskatchewan rivers.

Saskatchewan-Manitoba Boundary

Along the Saskatchewan-Manitoba boundary in 2015 there were excursions of nutrients (TP, TN, TDP, and unionized ammonia), metals (zinc, arsenic, cadmium, copper and selenium), major ions (sulphate, TDS), TSS, and pesticides (Tables 4, 6, 8 and 10). Similar to the rivers on the Alberta-Saskatchewan boundary peak flows and high TSS concentrations are frequently correlated. Likewise

high flow and high TSS are frequently associated with increased concentrations of some metals and nutrients.

There was an excursion to the total suspended solids objectives on at least one occasion for five of the six Saskatchewan-Manitoba boundary river sites in 2015. Objectives for TSS were set using the historical data, and included both an upper and lower limit to protect aquatic life, in particular to protect turbid water fish that are present in prairie river systems. Given the statistical approach used to set the TSS objectives there is an expectation that a certain number of excursions will occur over the long term (10% lower and 10% upper). For two of the rivers (Red Deer and Saskatchewan rivers) the excursions were less than or equal to the lower TSS objective. The other rivers exceeded the upper TSS objective. No exceedances were observed during the open water season for the Churchill River. The Carrot and the Assiniboine rivers exceeded the TSS objectives during higher flow periods in the spring and again in late summer. The Qu'Appelle River had excursions throughout the summer months (June, July, and August) in 2015. For the Saskatchewan River, all three observed excursions for this river were a result of low TSS concentrations which resulted in not meeting the lower objective limit.

Nutrient objectives were established with a statistical approach that evaluated the long-term data from each site. It is expected that there will be a certain proportion of excursions over the long term. Typically these are more frequent in some years and less frequent in other years. Thus, it is important to consider the overall trend and excursion frequency pattern. There were multiple nutrient excursions at several sites on the Saskatchewan - Manitoba boundary in 2015 (Table 4, 8). The Carrot River had a higher number of TP and TDP excursions, which occurred during the summer months, whereas the Qu'Appelle River had TP and TDP excursions in the late summer and early autumn, as well as TDP excursions in late winter. For the Carrot River TN also showed excursions in the spring and mid-summer. Of the Saskatchewan - Manitoba transboundary rivers, the Carrot River is the one river that has shown some statistically significant increasing trends in all nutrients and warrants further investigation.

For the Red Deer River (Erwood), TP and/or TDP exceeded the background objectives throughout the winter, spring and summer months, although there were no observed excursions of TN on this river in 2015. Some of the highest excursion on the Red Deer River appeared to occur during peak inflows in the spring.

Nutrients have been identified as a priority for prairie river systems by all jurisdictions; consequently the COWQ will conduct further work to investigate potential sources of nutrients and identify watersheds or sub-watersheds at high risk. The committee has initiated work on the Red Deer River (AB) and the Carrot River watersheds to assess point and non-point sources of nutrients to these transboundary rivers and organized a workshop (October 2016) to highlight and discuss prairie nutrient issues.

Five metals exceeded water quality objectives on the Saskatchewan-Manitoba boundary sites in 2015. Metal exceedances also coincided with exceedances of the TSS, with the exception of the July arsenic exceedance on the Assiniboine River. Three of the metals (total arsenic, total selenium and total zinc) exceeded the objective at one site each (Table 4). Total arsenic concentrations exceeded the water quality objective on two occasions in the summer of 2015 (July and August) in the Assiniboine River. Arsenic concentrations generally increase in the Assiniboine River during the summer. Selenium (total) exceeded the water quality objective on the Qu'Appelle River once in June of 2015. Elevated concentrations of selenium do not occur regularly on the Qu'Appelle River, and over the last 12 years (when the water quality data is compared to the 2015 water quality objectives) excursions were only previously observed in 2013. The median concentration of selenium in the Qu'Appelle River 2003-2015 was 0.54 µg/L, while the current water quality objective is 1.0 µg/L. The committee will evaluate whether similar excursions occur in 2016. Zinc exceeded the water quality objective once on the Carrot River in August following a small peak in flow and TSS.

Concentrations of sulphate and TDS exceeded

objectives on multiple occasions in the Assiniboine River in 2015. Sulphate and TDS objectives were set with a similar approach to nutrients, whereby statistical analysis using historical data was used to define an expected range of concentrations. As with nutrients, there is an expectation that there will be a certain proportion of excursions over the long term, however the percent exceedances were greater, 50% for sulphate and 33% for TDS, than what might be expected based on the methodology (10%). Sulphate and TDS exceeded the background objectives on the Assiniboine throughout the later winter and into the summer, although both parameters dropped to below the objective during spring freshet suggesting that the inflow at the time was low in salinity. The cause of the higher sulphates is not clear and the committee will assess whether this pattern continues in 2016.

There were three TDS excursions on the Red Deer (Erwood) River with all three occurring in winter (January, February and March). Assessment of long-term data from the Red Deer (Erwood) River found that typically around half of winter samples (January to March) are greater than the objective value of 500 mg/L TDS and therefore the 2015 frequency of TDS excursions at this site is not unexpected.

Concentrations of the pesticides dicamba and MCPA were found to exceed water quality objectives in 2015 (Table 6). Dicamba was detected above the water quality objective in the Assiniboine River on one occasion (April) and the Qu'Appelle River on two occasions (June, July). Concentrations of MCPA exceeded the water quality objective on the Carrot River in April 2015.

MCPA and dicamba belong to a group of pesticides known as acid herbicides. A recent review of the PPWB pesticide data by the committee highlighted that MCPA and dicamba exhibit regular patterns of excursions to the water quality objectives on the Carrot and Assiniboine rivers. Other rivers are not sampled annually for acid herbicides and consequently the excursion frequency and patterns are more difficult to evaluate. The report highlighted that the pesticide exceedances occur primarily during the spring and summer months and made several recommendations for follow-up actions. These recommendations included:

(1) The PPWB should notify each jurisdiction about the regular occurrence of acid herbicide (MCPA and Dicamba) excursions to the interprovincial water quality objectives. The PPWB should request feedback from each of the jurisdictions on the awareness of the pesticide concerns and any actions/programs that are being undertaken within the jurisdictions to address this issue.
(2) It is also recommended that PPWB request any additional, available pesticide data and potential impacts from the Alberta, Saskatchewan, and Manitoba provincial jurisdictions to expand the current data set and increase insight on pesticide prevalence and impacts in surface water on the prairies. In this case, the provincial jurisdictions should compile and review their data and report back to the PPWB.
(3) Annual monitoring in the Assiniboine and Carrot rivers should be maintained, but acid herbicide monitoring should be increased for the rivers that most frequently exhibit pesticide excursions. This includes the Battle, Red Deer (Alberta/Saskatchewan boundary), South Saskatchewan, Saskatchewan and Qu'Appelle rivers. The non-acid herbicide groups should continue to be monitored according to current protocol.

The PPWB, as noted earlier, has also recently implemented the monitoring of glyphosate and its metabolites as this is the highest single use pesticide in the prairies. In 2015, glyphosate was monitored on the Assiniboine and Carrot rivers on the Saskatchewan - Manitoba boundary. While the concentrations of glyphosate were low, concentrations were detected in all 12 water samples collected from the Assiniboine and 11 of the 12 samples collected from the Carrot River in 2015. The metabolite AMPA was also found to be present at higher concentrations in all 12 water sampled collected from the two rivers. Currently the PPWB does not have an objective for glyphosate or AMPA but will continue to report detections of this pesticide.

Table 3 **Excursion frequency summary table for Alberta - Saskatchewan water quality stations. The number of excursions is provided on the left and the total number of objective comparisons for each parameter provided in brackets to the right.**

	ALBERTA - SASKATCHEWAN BOUNDARY					
	BATTLE RIVER	BEAVER RIVER	COLD RIVER	NORTH. SASK. RIVER	RED DEER RIVER A/S	SOUTH SASK. RIVER
METALS						
ARSENIC DISSOLVED	---	---	---	---	---	---
ARSENIC TOTAL	1(12)	0(12)	0(12)	0(12)	2(12)	0(12)
BARIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
BERYLLIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
BORON TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
CADMIUM TOTAL	1(12)	0(12)	1(12)	1(12)	---	3(12)
CHROMIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
COBALT TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
COPPER TOTAL	2(12)	0(12)	0(12)	1(12)	---	1(12)
IRON DISSOLVED	0(12)	1(12)	0(12)	0(12)	1(12)	0(12)
LEAD TOTAL	1(12)	0(12)	0(12)	0(12)	2(12)	1(12)
LITHIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
MANGANESE DISSOLVED	---		0(12)	0(12)	1(12)	0(12)
MOLYBDENUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
NICKEL DISSOLVED	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
SELENIUM TOTAL	0(12)	0(12)	0(12)	0(12)	1(12)	0(12)
SILVER TOTAL	0(12)	0(12)	0(12)	0(12)	2(12)	0(12)
THALLIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
URANIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
VANADIUM TOTAL	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
ZINC TOTAL	1(12)	0(12)	0(12)	0(12)	2(12)	0(12)
NUTRIENTS						
AMMONIA UN-IONIZED	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
PHOSPHORUS TOTAL *	3(12)	1(12)	0(12)	0(12)	3(12)	1.5(12)
PHOSPHORUS TOTAL DISSOLVED *	4(12)	1.5(12)	0(12)	0.5(12)	3.5(12)	1.5(12)
NITROGEN TOTAL *	1(12)	0(12)	0(12)	0.5(12)	2(12)	2(12)
NITROGEN DISSOLVED NO3 & NO2	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
MAJOR IONS						
CHLORIDE DISSOLVED	0(12)	0(12)	0(12)	0(12)	0(12)	0(12)
FLUORIDE DISSOLVED	0(12)	0(12)	0(12)	1(12)	0(12)	3(12)
SODIUM DISSOLVED/FILTERED	3(12)	0(12)	0(12)	0(12)	0(12)	0(12)
SULPHATE DISSOLVED	1(12)	0(12)	0(12)	0(12)	0(12)	0(12)
TOTAL DISSOLVED SOLIDES	3(12)	0(12)	0(12)	0(12)	1(12)	0(12)
BIOTA						
COLIFORMS FECAL	3(12)	1(12)	0(12)	2(12)	2(12)	0(12)
ESCHERICHIA COLI	0(12)	0(12)	0(12)	1(12)	2(12)	0(12)
PHYSICALS & OTHERS						
OXYGEN DISSOLVED	0(5)	0(4)	0(11)	0(11)	0(11)	0(12)
PH	0(11)	0(11)	0(11)	0(11)	0(12)	0(12)
SODIUM ABSORPTION RATIO	---	0(12)	0(12)	0(12)	0(12)	0(12)
TOTAL SUSPENDED SOLIDS	1(7)	1(7)	5(7)	4(7)	2(12)	1(7)
Number of Excursion Comparisons	**395**	**406**	**425**	**425**	**402**	**427**
Total Number of Excursions Observed	**25**	**5.5**	**6**	**11**	**26.5**	**14**
Sampling Frequency (no./year)	**12**	**12**	**12**	**12**	**12**	**12**

*** Summary information – details in Table 7**

Table 4 **Excursion frequency summary table for Saskatchewan - Manitoba water quality stations. The number of excursions is provided on the left and the total number of objective comparisons for each parameter provided in brackets to the right.**

	SASKATCHEWAN-MANITOBA BOUNDARY					
	ASSINIBOINE RIVER	CARROT RIVER	CHURCHILL RIVER	QU'APPELLE RIVER	RED DEER RIVER S/M	SASK. RIVER
METALS						
ARSENIC DISSOLVED	---	0(12)	---	0(12)	---	---
ARSENIC TOTAL	2(12)	---	0(4)	---	0(12)	0(12)
BARIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
BERYLLIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
BORON TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
CADMIUM TOTAL	0(12)	2(12)	0(4)	0(12)	1(12)	0(12)
CHROMIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
COBALT TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
COPPER TOTAL	0(12)	2(12)	0(4)	3(12)	0(12)	0(12)
IRON DISSOLVED	0(12)	---	0(4)	0(12)	0(12)	0(12)
LEAD TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
LITHIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
MANGANESE DISSOLVED	---	---	0(4)	---	0(12)	0(12)
MOLYBDENUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
NICKEL DISSOLVED	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
SELENIUM TOTAL	0(12)	0(12)	0(4)	1(12)	0(12)	0(12)
SILVER TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
THALLIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
URANIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
VANADIUM TOTAL	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
ZINC TOTAL	0(12)	1(12)	0(4)	0(12)	0(12)	0(12)
NUTRIENTS						
AMMONIA UN-IONIZED	0(12)	0(12)	0(4)	1(12)	0(12)	0(10)
PHOSPHORUS TOTAL *	0(12)	6(12)	0(4)	3.5(12)	3.5(12)	1(12)
PHOSPHORUS TOTAL DISSOLVED *	0(12)	6.5(12)	0(4)	5(12)	4.5(12)	0(12)
NITROGEN TOTAL *	3(11)	2(12)	0(4)	0(11)	0(12)	0(12)
NITROGEN DISSOLVED NO3 & NO2	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
MAJOR IONS						
CHLORIDE DISSOLVED	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
FLUORIDE DISSOLVED	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
SODIUM DISSOLVED/FILTERED	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
SULPHATE DISSOLVED	6(12)	3(12)	0(4)	0(12)	0(12)	0(12)
TOTAL DISSOLVED SOLIDS	4(12)	0(12)	0(4)	0(12)	3(12)	0(12)
BIOTA						
COLIFORMS FECAL	0(12)	0(12)	---	0(12)	0(12)	0(12)
ESCHERICHIA COLI	0(12)	0(12)	---	0(12)	0(12)	0(12)
PHYSICALS & OTHERS						
OXYGEN DISSOLVED	0(12)	0(7)	0(4)	0(12)	0(12)	0(12)
PH	0(12)	0(12)	0(4)	0(12)	0(12)	0(12)
SODIUM ABSORPTION RATIO	0(12)	---	0(4)	---	0(12)	0(12)
TOTAL SUSPENDED SOLIDS	2(7)	2(6)	0(4)	3(6)	1(6)	3(7)
Number of Excursion Comparisons	**415**	**385**	**143**	**402**	**426**	**427**
Total Number of Excursions Observed	**17**	**24.5**	**0**	**16.5**	**13**	**4**
Sampling Frequency (no./year)	**12**	**12**	**4**	**12**	**12**	**12**

*** Summary information – details in Table 8**

Table 5 **Excursion frequency summary table of pesticides for Alberta - Saskatchewan water quality stations. The number of excursions is provided on the left and the total number of objective comparisons for each parameter provided in brackets to the right.**

	ALBERTA - SASKATCHEWAN BOUNDARY					
	BATTLE RIVER	BEAVER RIVER	COLD RIVER	NORTH. SASK. RIVER	RED DEER RIVER A/S	SOUTH SASK. RIVER
PESTICIDES						
2,4-D	0(8)				0(8)	0(8)
ATRAZINE	0(8)				0(8)	NA
BROMOXYNIL	0(8)				0(8)	0(8)
DICAMBA	0(8)				0(8)	1(8)
DICLOFOP-METHYL	0(8)				0(8)	NA
ENDOSULFAN	0(8)				0(8)	NA
GAMMA-BENZENEHEXACHLORIDE	0(8)				0(8)	NA
HEXACHLOROBENZENE	0(8)				0(8)	NA
MCPA	0(8)	Not Sampled	Not Sampled	Not Sampled	0(8)	1(8)
METOLACHLOR	0(8)				0(8)	NA
METRIBUZIN	0(8)				0(8)	NA
PENTACHLOROPHENOL (PCP)	---				---	NA
PICLORAM	0(8)				0(8)	0(8)
SIMAZINE	0(8)				0(8)	NA
TRIALLATE	0(8)				0(8)	NA
TRIFLURALIN	0(8)				0(8)	NA
GLYPHOSATE	8 (8)[a]				8(8)[a]	Not Sampled
Number of Excursion Comparisons	**120**				**120**	**40**
Total Number of Excursions Observed	**0**				**0**	**2**
Sampling Frequency (no./year)	**8**				**8**	**8**

a= Detected at low levels, not included in the excursion counts

Table 6 **Excursion frequency summary table of pesticides for Saskatchewan-Manitoba water quality stations. The number of excursions is provided on the left and the total number of objective comparisons for each parameter provided in brackets to the right.**

	SASKATCHEWAN-MANITOBA BOUNDARY					
	ASSINIBOINE RIVER	CARROT RIVER	CHURCHILL RIVER	QU'APPELLE RIVER	RED DEER RIVER S/M	SASK. RIVER
PESTICIDES						
2,4-D	0(12)	0(12)		0(9)		0(9)
ATRAZINE	0(12)	0(12)		NA		NA
BROMOXYNIL	0(12)	0(12)		0(9)		0(9)
DICAMBA	1(12)	0(12)		2(9)		0(9)
DICLOFOP-METHYL	0(12)	0(12)		NA		NA
ENDOSULFAN	0(12)	0(11)		NA		NA
GAMMA-BENZENEHEXACHLORIDE	0(12)	0(11)		NA		NA
HEXACHLOROBENZENE	0(12)	0(11)		NA		NA
MCPA	0(12)	1(12)	Not Sampled	0(9)	Not Sampled	0(9)
METOLACHLOR	0(12)	0(12)		NA		NA
METRIBUZIN	0(12)	0(12)		NA		NA
PENTACHLOROPHENOL (PCP)	---	---		---		---
PICLORAM	0(12)	0(12)		0(9)		0(9)
SIMAZINE	0(12)	0(12)		NA		NA
TRIALLATE	0(12)	0(12)		NA		NA
TRIFLURALIN	0(12)	0(12)		NA		NA
GLYPHOSATE	12 (12)[a]	11(12)[a]		Not Sampled		Not sampled
Number of Excursion Comparisons	**180**	**177**		**45**		**45**
Total Number of Excursions Observed	**1**	**1**		**2**		**0**
Sampling Frequency (no./year)	**12**	**12**		**9**		**9**

a= Detected at low levels, not included in the excursion counts

Table 7 Nutrient Excursions for Alberta - Saskatchewan water quality stations

LOCATION		TOTAL PHOSPHORUS		TOTAL DISSOLVED PHOSPHORUS		TOTAL NITROGEN		Number of Excursion Comparisons	Total Number of Excursions Observed
BATTLE RIVER	Open Water	1(7)	1(7)	2(7)		1(7)		36	8
	Ice-Covered	2(5)	2(5)	2(5)		0(5)			
BEAVER RIVER	Open Water	1(7)		1(7)	1(7)	0(7)		36	2.5
	Ice-Covered	0(5)		1(5)	0(5)	0(5)			
COLD RIVER	Open Water	0(7)		0(7)		0(7)	0(7)	36	0
	Ice-Covered	0(5)		0(5)		0(5)	0(5)		
NORTH. SASK. RIVER	Open Water	0(7)	0(7)	1(7)	0(7)	1(7)	0(7)	36	1
	Ice-Covered	0(5)	0(5)	0(5)	0(5)	0(5)	0(5)		
RED DEER RIVER A/S	Open Water	2(7)	1(7)	2(7)	2(7)	1(7)		36	8.5
	Ice -Covered	2(5)	1(5)	2(5)	1(5)	1(5)			
SOUTH SASK. RIVER	Open Water	2(7)	1(7)	1(7)	1(7)	2(7)	2(7)	36	5
	Ice-Covered	0(5)	0(5)	1(5)	0(5)	0(5)	0(5)		

Down ward Trend | Upward Trend | No Trend

Open water season = April or May to October

Table 8 Nutrient Excursions for Saskatchewan - Manitoba water quality stations

LOCATION		TOTAL PHOSPHORUS		TOTAL DISSOLVED PHOSPHORUS		TOTAL NITROGEN		Number of Excursion Comparisons	Total Number of Excursions Observed
ASSINIBOINE RIVER	Open Water	0(7)		0(7)		0(7)		36	3
	Ice-Covered	0(5)		0(5)		3(4)			
CARROT RIVER	Open Water	6(6)	4(6)	6(6)	5(6)	2(6)	0(6)	36	14.5
	Ice-Covered	1(6)	1(6)	1(6)	1(6)	2(6)	0(5)		
CHURCHILL RIVER	Open Water	0(3)		0(3)		0(3)		12	0
	Ice-Covered	0(1)		0(1)		0(1)			
QU'APPELLE RIVER	Open Water	4(6)	3(6)	3(6)	3(6)	0(6)		36	8.5
	Ice-Covered	0(6)	0(6)	4(6)	0(6)	0(6)			
RED DEER RIVER S/M	Open Water	3(6)	2(6)	3(6)	1(6)	0(6)		36	8
	Ice -Covered	1(6)	1(6)	4(6)	1(6)	0(6)			
SASK. RIVER	Open Water	0(7)	0(7)	0(7)	0(7)	0(7)		36	1
	Ice-Covered	1(5)	1(5)	0(5)	0(5)	0(5)			

Down ward Trend | Upward Trend | No Trend

Open water season = April or May to October

Nutrient objectives have been determined based on analysis of historical data, which indicated that concentrations vary with season (open water *versus* ice covered) and in some cases showed trends. In all cases a site-specific base nutrient objective was set at the 90th percentile of the data for each season, which would be exceeded on average 10% of the time (values in yellow and white boxes). Where statistical trends existed, an additional objective was established based on the 90th percentile of the lowest value 10 year period (values in blue boxes=decreasing trend; green boxes=increasing trend). Exceedance of this second objective indicates a nutrient concentration greater than the 90th percentile of the lowest 10 year period for that site.

The total number of excursions is calculated as the sum of the base objective exceedances (yellow boxes) plus the arithmetic average of the trend (blue or green boxes) and corresponding base (white boxes) objective exceedances.

Table 9 **Overall excursion summary, by category, for Alberta - Saskatchewan water quality stations**

	ALBERTA / SASKATCHEWAN BORDER					
	BATTLE RIVER	BEAVER RIVER	COLD RIVER	NORTH. SASK. RIVER	RED DEER RIVER A/S	SOUTH SASK. RIVER
Category						
METALS	6(228)	1(228)	1(240)	2(240)	11(216)	5(240)
NUTRIENTS (TN, TP, TDP)	8(36)	2.5(36)	0(36)	1(36)	8.5(36)	5(36)
NUTRIENTS (TOXICITY)	0(24)	0(24)	0(24)	0(24)	0(24)	0(24)
MAJOR IONS	7(60)	0(60)	0(60)	1(60)	1(60)	3(60)
BIOTA	3(24)	1(24)	0(24)	3(24)	4(24)	0(24)
PHYSICAL & OTHER	1(23)	1(34)	5(41)	4(41)	2(42)	1(43)
PESTICIDES	0(120)	ND	ND	ND	0(120)	2(40)
Number of Excursion Comparisons	515	406	425	425	522	467
Total Number of Excursions Observed	25	5.5	6	11	26.5	16
Sampling Frequency (no./year)	12	12	12	12	12	12
Overall Adherence Rate	95.1	98.6	98.6	97.41	94.9	96.57

Table 10 **Overall excursion summary, by category, for Saskatchewan - Manitoba water quality stations**

	ASSINIBOINE RIVER	CARROT RIVER	CHURCHILL RIVER	QU'APPELLE RIVER	RED DEER RIVER S/M	SASK. RIVER
Category						
METALS	2(228)	5(216)	0(80)	4(228)	1(240)	0(240)
NUTRIENTS (TN, TP, TDP)	3(36)	14.5(36)	0(12)	8.5(36)	8(36)	1(36)
NUTRIENTS (TOXICITY)	0(24)	0(24)	0(8)	1(24)	0(24)	0(24)
MAJOR IONS	10(60)	3(60)	0(20)	0(60)	3(60)	0(60)
BIOTA	0(24)	0(24)	0(8)	0(24)	0(24)	0(24)
PHYSICAL & OTHER	2(43)	2(25)	0(15)	3(30)	1(42)	3(43)
PESTICIDES	1(180)	1(177)	ND	2(45)	ND	0(45)
Number of Excursion Comparisons	595	562	143	447	426	472
Total Number of Excursions Observed	18	25.5	0	18.5	13	4
Sampling Frequency (no./year)	12	12	4	12	12	12
Overall Adherence Rate	97.0	95.5	100.0	95.9	96.9	99.15

CONCLUSIONS

Interprovincial water quality objectives set at the 12 transboundary river reaches are designed to protect water uses for aquatic life, agriculture, recreation, treatability of source water, and fish consumption. Interprovincial water quality objectives were met on average 96.5% of the time in 2015. The committee concludes that most of the time, water quality objectives were met in the transboundary rivers and uses were protected. There is an expectation that objectives will be exceeded occasionally (particularly for those set with the background method) and that some exceedances will occur naturally (for example, during high flow events).

The adherence rate to interprovincial water quality objectives ranged from 100% (Churchill River) to 94.9% (Red Deer River, AB/SK) indicating that water quality was generally suitable for the intended water uses for these rivers. Generally, each of the 12 transboundary river reaches has shown little variation in adherence rate during the past 12 years.

Overall, excursions for nutrients, TSS, and major ions were the most common among sites. Excursions for total metals were more prevalent at the AB/SK sites. Excursions of TDS, sulphate, and pesticides occurred at specific rivers. The results of this excursion report, in addition to those from previous years and trend analysis work conducted by the committee, indicates a number of areas that warrant further consideration by the committee, Board, and/or provinces.

- The highest priority was assigned to the assessment of exceedances of nutrient objectives such as the Carrot River. The committee's work to understand sources and trends of nutrients is ongoing and will be helpful with this overall priority.
- For pesticides, the frequent exceedance of MCPA and dicamba objectives in prairie rivers is suggestive of a wide spread presence of pesticides in the environment. This observation warrants further exploration to better understand the prevalence of pesticides and potential effects. The COWQ recommends that the acid herbicides in the South Saskatchewan and Qu'Appelle rivers be monitored annually to better understand the inter-annual variability and seasonal pattern of pesticide concentration at these sites. The COWQ will also work with the jurisdictions to better understand the effects to the aquatic environment and users of these waters.
- Trends in metal concentrations and relationships to physical parameters, including flow and suspended solids, should be examined on select rivers to gain further understanding on how these factors influence metal concentrations in transboundary rivers.
- Overall, in comparison to the other sites, the Red Deer River (AB/SK) had the lowest adherence rate to the newly implemented water quality objectives (due to excursions in nutrients, metals, major ions, bacteria, and TSS) in 2015. The Red Deer River also had the largest variance in adherence rates when the historical data from the last 13 years was compared to the new 2015 water quality objectives. In response to the excursions the committee will compile available information on the Red Deer River and will make recommendations on whether further investigation is warranted.

The prairies have higher saline waters and constituent ions that vary based on precipitation and groundwater inputs. For TDS and sulphate, some of these objectives were also set with a background approach so there is an expectation of some exceedances. At this point, an investigation into these exceedances is not a priority because there is no evidence that these exceedances are a direct result of human activities. However, the COWQ will continue to track these parameters and re-evaluate this interpretation as more data become available.

ON-GOING

Interprovincial water quality objectives have been reviewed for all transboundary river reaches. Revised objectives were approved by Ministers responsible for the PPWB on July 8th, 2015. These water quality objectives are now being applied to all water quality data, and this report represents the first report to compare water quality data to these new objectives. The committee will continue to work on water quality objectives, particularly in those areas where objectives were not established for select parameters and rivers.

Current activities of the COWQ include further review of excursions to the approved interprovincial water quality objectives and prioritization of any potential issues for further consideration or actions. Several areas have been flagged by the COWQ including nutrients, which have been assessed as a priority. While nutrients have been assigned the highest priority in all transboundary watersheds, there is a focus on investigating nutrient levels in two transboundary watersheds as a pilot program: the Red Deer River (AB/SK) and Carrot River watersheds. The pilot project has been initiated and preliminary results from this study are anticipated in 2016. The study objectives were:

- Objective 1 - determine a comprehensive state of knowledge on the major sources of nutrients including point and non-point sources in the Red Deer and Carrot River watersheds.
- Objective 2 - determine a current understanding of the major influences to, and causes of, current nutrient concentrations and trends in the Red Deer River and Carrot River watersheds.

Pesticides have also been identified as a priority area for future work by the committee. The COWQ has also completed a review of all available pesticide data for the PPWB transboundary rivers and will continue to follow up on pesticides with the jurisdictions with particular emphasis on the acid herbicides, which are the most frequently detected pesticides in transboundary rivers.

Evaluating long-term trends in water quality data in conjunction with the assessment of excursions to water quality objectives will continue to assist the committee to assess areas of potential concern and to set future priorities. The committee is currently working on finalizing updated analysis of trends for nutrients, major ions, and metals at the 12 transboundary river sites.

REFERENCES

MAA Schedule E 1992. Agreement on Water Quality.
http://www.ppwb.ca/information/115/index.html

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A1: Alberta - Saskatchewan

2015 Interprovincial Water Quality Objectives– AB-SK Boundary						
Parameter	River					
Nutrients	Battle River	Beaver River	Cold River	North Saskatchewan River	Red Deer River (Bindloss)	South Saskatchewan River
Nitrate as N (mg/L)	3	3	3	3	3	3
Ammonia Un-ionized (mg/L)	0.019 [a]	0.019 [a]	0.019 [a]	0.019 [a]	0.019 [a]	0.019 [a]
Major Ions						
Total Dissolved Solids (mg/L)	872	500	500	500	500	500
Sulphate Dissolved (mg/L)	250	250	250	250	250	250
Sodium Dissolved (mg/L)	200	200	200	200	200	200
Fluoride Dissolved (mg/L)	0.31	0.19	0.12	0.18	0.2	0.19
Chloride Dissolved (mg/L)	100	100	100	100	100	100
Physicals and Other						
pH Lab	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
pH Field	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0
Oxygen Dissolved (mg/L)						
Open Water Season (>5°C)	5	5	5	5	5	5
Ice Covered Season (<5°C)	Under Review	Under Review	3	3	3	3
Sodium Adsorption Ratio	Under Review	3	3	3	3	3
Total Suspended Solids (mg/L)	5.0 - 320.0	3.0 - 48.8	1.2 - 4.8	5.0 - 295.8	30.0 - 832.6	5.6 - 339.8
Biota						
E. Coli (No./100 mL)	200	200	200	200	200	200
Coliforms Fecal (No./100 mL)	100	100	100	100	100	100
Metals						
Arsenic Total (µg/L)	5	5	5	5	5	5
Arsenic Dissolved (µg/L)	No Objective	No Objective	No Objective	No Objective	No Objective	No Objective
Barium Total (µg/L)	1000	1000	1000	1000	1000	1000
Beryllium Total (µg/L)	100	100	100	100	100	100
Boron Total (µg/L)	500 [b]	500 [b]	500 [b]	500 [b]	500 [b]	500 [b]
Cadmium Total (µg/L)	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]	Under Review	Calculated[c]
Chromium Total (µg/L)	50	50	50	50	50	50
Cobalt Total (µg/L)	50	50	50	50	50	50
Copper Total (µg/L)	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]	Under Review	Calculated[c]
Iron Dissolved (µg/L)	300	300	300	300	300	300
Lead Total (µg/L)	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]
Lithium Total (µg/L)	2500	2500	2500	2500	2500	2500
Manganese Dissolved (µg/L)	Under Review	Under Review	50	50	50	50
Molybdenum Total (µg/L)	10 [d]	10 [d]	10 [d]	10 [d]	10 [d]	10 [d]
Nickel Dissolved (µg/L)	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]
Selenium Total (µg/L)	1	1	1	1	1	1
Silver Total (µg/L)	0.1	0.1	0.1	0.1	0.1	0.1
Thallium Total (µg/L)	0.8	0.8	0.8	0.8	0.8	0.8
Uranium Total (µg/L)	10	10	10	10	10	10
Vanadium Total (µg/L)	100	100	100	100	100	100
Zinc Total (µg/L)	30	30	30	30	30	30

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A2: Alberta - Saskatchewan

2015 Water Quality Objectives – AB-SK Boundary						
Parameter	**River**					
Pesticides	**Battle River**	**Beaver River**	**Cold River**	**North Saskatchewan River**	**Red Deer River (Bindloss)**	**South Saskatchewan River**
Acid Herbicides						
2,4-D (µg/L)	4	4	4	4	4	4
Bromoxynil (µg/L)	0.33	0.33	0.33	0.33	0.33	0.33
Dicamba (µg/L)	0.006	0.006	0.006	0.006	0.006	0.006
MCPA (µg/L)	0.025	0.025	0.025	0.025	0.025	0.025
Picloram (µg/L)	29	29	29	29	29	29
Organochlorine Pesticides in Water						
Endosulfan (µg/L)	0.003	0.003	0.003	0.003	0.003	0.003
Hexachlorocyclohexane (gamma-HCH) (Lindane) (µg/L)	0.01	0.01	0.01	0.01	0.01	0.01
Hexachlorobenzene (µg/L)	0.52	0.52	0.52	0.52	0.52	0.52
Pentachlorophenol (PCP) (µg/L)	0.5	0.5	0.5	0.5	0.5	0.5
Neutral Herbicides in Water						
Atrazine (µg/L)	1.8	1.8	1.8	1.8	1.8	1.8
Diclofopmethyl (Hoegrass)* (µg/L)	0.18	0.18	0.18	0.18	0.18	0.18
Metolachlor (µg/L)	7.8	7.8	7.8	7.8	7.8	7.8
Metribuzin (µg/L)	0.5	0.5	0.5	0.5	0.5	0.5
Simazine (µg/L)	0.5	0.5	0.5	0.5	0.5	0.5
Triallate (µg/L)	0.24	0.24	0.24	0.24	0.24	0.24
Trifluralin (µg/L)	0.2	0.2	0.2	0.2	0.2	0.2
Other						
Glyphosate (µg/L)	Report Detections	Report Detections	Report Detections	Report Detections	Report Detections	Report Detections

Superscripts
a.
Legend

Protection of Aquatic Life	Ag-Livestock	Ag-Irrigation	Recreation	Treatability	Ag-Irrigation + Treatability	Ag-Irrigation and Livestock	Fish Consumption

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A3: Saskatchewan - Manitoba

2015 Interprovincial Water Quality Objectives – SK-MB Boundary							
Parameter	River						
Nutrients	Assiniboine River	Carrot River		Churchill River	Qu'Appelle River	Red Deer River (Erwood)	Saskatchewan River
		Open	Closed				
Nitrate as N (mg/L)	3	3		3	3	3	3
Ammonia Un-ionized (mg/L)	0.019 [a]	0.019 [a]		0.019 [a]	0.019 [a]	0.019 [a]	0.019 [a]
Major Ions							
Total Dissolved Solids (mg/L)	834	742	1672	500	1144	500	500
Sulphate Dissolved (mg/L)	299	250		250	486	250	250
Sodium Dissolved (mg/L)	200	164	442	200	200	200	200
Fluoride Dissolved (mg/L)	0.26	0.20	0.29	0.12	0.25	0.18	0.18
Chloride Dissolved (mg/L)	100	267	728	100	100	100	100
Physicals and Other							
pH Lab	6.5-9.0	6.5-9.0		6.5-9.0.	6.5-9.0	6.5-9.0	6.5-9.0
pH Field	6.5-9.0	6.5-9.0		6.5-9.0.	6.5-9.0	6.5-9.0	6.5-9.0
Oxygen Dissolved (mg/L)							
Open Water Season (>5°C)	5	5		5	5	5	5
Ice Covered Season (<5°C)	3	Under Review		3	3	3	3
Sodium Adsorption Ratio	3	Under Review		3	Under Review	3	3
Total Suspended Solids (mg/L)	5.0 - 69.2	6.08 - 98.2		2.2 - 6.2	22.6 - 122.2	1.0 -19.7	27.0 - 125.0
Biota							
E. Coli (No./100 mL)	200	200		200	200	200	200
Coliforms Fecal (No./100 mL)	100	100		100	100	100	100
Metals							
Arsenic Total (µg/L)	5	No Objective		5	No Objective	5	5
Arsenic Dissolved (µg/L)	No Objective	50		No Objective	50	No Objective	No Objective
Barium Total (µg/L)	1000	1000		1000	1000	1000	1000
Beryllium Total (µg/L)	100	100		100	100	100	100
Boron Total (µg/L)	500 [b]	500 [b]		500 [b]	500 [b]	500 [b]	500 [b]
Cadmium Total (µg/L)	Calculated[c]	Calculated[c]		Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]
Chromium Total (µg/L)	50	50		50	50	50	50
Cobalt Total (µg/L)	50	50		50	50	50	50
Copper Total (µg/L)	Calculated[c]	Calculated[c]		Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]
Iron Dissolved (µg/L)	300	Under Review		300	300	300	300
Lead Total (µg/L)	Calculated[c]	Calculated[c]		Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]
Lithium Total (µg/L)	2500	2500		2500	2500	2500	2500
Manganese Dissolved (µg/L)	Under Review	Under Review		50	Under Review	50	50
Molybdenum Total (µg/L)	10 [d]	10 [d]		10 [d]	10 [d]	10 [d]	10 [d]
Nickel Dissolved (µg/L)	Calculated[c]	Calculated[c]		Calculated[c]	Calculated[c]	Calculated[c]	Calculated[c]
Selenium Total (µg/L)	1	1		1	1	1	1
Silver Total (µg/L)	0.1	0.1		0.1	0.1	0.1	0.1
Thallium Total	0.8	0.8		0.8	0.8	0.8	0.8
Uranium Total (µg/L)	10	10		10	10	10	10
Vanadium Total (µg/L)	100	100		100	100	100	100
Zinc Total (µg/L)	30	30		30	30	30	30

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A4: Saskatchewan - Manitoba

2015 Water Quality Objectives– SK-MB Boundary							
Parameter	River						
Pesticides	Assiniboine River	Carrot River		Churchill River	Qu'Appelle River	Red Deer River (Erwood)	Saskatchewan River
		Open	Closed				
Acid Herbicides							
2,4-D (µg/L)	4	4		4	4	4	4
Bromoxynil (µg/L)	0.33	0.33		0.33	0.33	0.33	0.33
Dicamba (µg/L)	0.006	0.006		0.006	0.006	0.006	0.006
MCPA (µg/L)	0.025	0.025		0.025	0.025	0.025	0.025
Picloram (µg/L)	29	29		29	29	29	29
Organochlorine Pesticides in Water							
Endosulfan (µg/L)	0.003	0.003		0.003	0.003	0.003	0.003
Hexachlorocyclohexane (gamma-HCH) (Lindane) (µg/L)	0.01	0.01		0.01	0.01	0.01	0.01
Hexachlorobenzene (µg/L)	0.52	0.52		0.52	0.52	0.52	0.52
Pentachlorophenol (PCP) (µg/L)	0.5	0.5		0.5	0.5	0.5	0.5
Neutral Herbicides in Water							
Atrazine (µg/L)	1.8	1.8		1.8	1.8	1.8	1.8
Diclofopmethyl (Hoegrass)* (µg/L)	0.18	0.18		0.18	0.18	0.18	0.18
Metolachlor (µg/L)	7.8	7.8		7.8	7.8	7.8	7.8
Metribuzin (µg/L)	0.5	0.5		0.5	0.5	0.5	0.5
Simazine (µg/L)	0.5	0.5		0.5	0.5	0.5	0.5
Triallate (µg/L)	0.24	0.24		0.24	0.24	0.24	0.24
Trifluralin (µg/L)	0.2	0.2		0.2	0.2	0.2	0.2
Other							
Glyphosate (µg/L)	Report Detections	Report Detections		Report Detections	Report Detections	Report Detections	Report Detections

a. Ammonia guideline: Expressed as µg unionized ammonia·L-1. This would be equivalent to 15.6 µg ammonia-nitrogen·L-1. Guideline for total ammonia is temperature and pH dependent, please consult factsheet for more information.

b. Guideline is crop-specific 500 to 6000µg/L.

c. Value is a function of hardness (mg/L) in the water column. The objective is a calculated value.
Cadmium Concentration = $10^{0.86[\log10(\text{hardness})]-3.2}$ µg/L
Copper Concentration – $e^{0.8545[\ln(\text{hardness})-1.465}$ *0.2 µg/L The copper objective is a minimum of 2 µg/L regardless of water hardness. If the water hardness is not known, the objective is 2 µg/L. The Objective maximum is 4 µg/L
Lead Concentration = $e^{1.273[\ln \text{hardness})]-4.705}$ µg/L The objective is a minimum of 1 µg/L regardless of water hardness. If the water hardness is not known, the objective is 1 µg/L.
Nickel Concentration = exp {0.8460[ln (hardness)]+0.0584}*0.997

d. Molybdenum guideline = up to 50 µg·L-1 for short-term use on acidic soils.

Legend

Protection of Aquatic Life	Ag-Livestock	Ag-Irrigation	Recreation	Treatability	Ag-Irrigation + Treatability	Ag-Irrigation and Livestock	Fish Consumption

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A5: Alberta - Saskatchewan

2015 Water Quality Objectives – Alberta - Saskatchewan Boundary

Parameter	River					
	Battle River	Beaver River	Cold River	North Saskatchewan River	Red Deer River (Bindloss)	South Saskatchewan River
Physicals and Other						
Reactive Chlorine Species (mg/L)	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Cyanide (free) (mg/L)	0.005	0.005	0.005	0.005	0.005	0.005
Metals						
Mercury (total) (µg/L)	0.026	0.026	0.026	0.026	0.026	0.026
Fish Tissue						
Mercury in Fish (muscle) (µg/kg)	200	200	200	200	200	200
Arsenic in fish (muscle) (µg/kg)	3500	3500	3500	3500	3500	3500
Lead In fish (muscle) (µg/kg)	500	500	500	500	500	500
DDT (total) in fish (muscle) (µg/kg)	5000	5000	5000	5000	5000	5000
Aquatic Biota Consumption						
PCB in fish (muscle) mammalian (µg TEQ/kg diet wet weight)	0.00079	0.00079	0.00079	0.00079	0.00079	0.00079
PCB in fish (muscle) avian (µg TEQ/kg diet wet weight)	0.0024	0.0024	0.0024	0.0024	0.0024	0.0024
DDT total in fish (muscle) (µg/kg diet wet weight)	14	14	14	14	14	14
Toxaphene in fish (muscle) (µg/kg diet wet weight)	6.3	6.3	6.3	6.3	6.3	6.3
Radioactive						
Cesium-137 (Bq/L)	10	10	10	10	10	10
Iodine-131 (Bq/L)	6	6	6	6	6	6
Lead-210 (Bq/L)	0.2	0.2	0.2	0.2	0.2	0.2
Radium-226 (Bq/L)	0.5	0.5	0.5	0.5	0.5	0.5
Strontium-90 (Bq/L)	5	5	5	5	5	5
Tritium (Bq/L)	7000	7000	7000	7000	7000	7000

Legend

Protection of Aquatic Life	Treatability	Fish Consumption

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A6: Saskatchewan - Manitoba

2015 Water Quality Objectives– Saskatchewan - Manitoba Boundary							
Parameter	River						
	Assiniboine River	Carrot River		Churchill River	Qu'Appelle River	Red Deer River (Erwood)	Saskatchewan River
		Open	Closed				
Physicals and Other							
Reactive Chlorine Species (mg/L)	0.0005	0.0005		0.0005	0.0005	0.0005	0.0005
Cyanide (free) (mg/L)	0.005	0.005		0.005	0.005	0.005	0.005
Metals							
Mercury (total) (µg/L)	0.026	0.026		0.026	0.026	0.026	0.026
Fish Tissue							
Mercury in Fish (muscle) (µg/kg)	200	200		200	200	200	200
Arsenic in fish (muscle) (µg/kg)	3500	3500		3500	3500	3500	3500
Lead In fish (muscle) (µg/kg)	500	500		500	500	500	500
DDT (total) in fish (muscle) (µg/kg)	5000	5000		5000	5000	5000	5000
Aquatic Biota Consumption							
PCB in fish (muscle) mammalian (µg TEQ/kg diet wet weight)	0.00079	0.00079		0.00079	0.00079	0.00079	0.00079
PCB in fish (muscle) avian (µg TEQ/kg diet wet weight)	0.0024	0.0024		0.0024	0.0024	0.0024	0.0024
DDT total in fish (muscle) (µg/kg diet wet weight)	14	14		14	14	14	14
Toxaphene in fish (muscle) (µg/kg diet wet weight)	6.3	6.3		6.3	6.3	6.3	6.3
Radioactive							
Cesium-137 (Bq/L)	10	10		10	10	10	10
Iodine-131 (Bq/L)	6	6		6	6	6	6
Lead-210 (Bq/L)	0.2	0.2		0.2	0.2	0.2	0.2
Radium-226 (Bq/L)	0.5	0.5		0.5	0.5	0.5	0.5
Strontium-90 (Bq/L)	5	5		5	5	5	5
Tritium (Bq/L)	7000	7000		7000	7000	7000	7000

Legend

Protection of Aquatic Life	Treatability	Fish Consumption

APPENDIX 1: WATER QUALITY OBJECTIVES

Table A7: Site-Specific Nutrient Objectives, Both Boundaries

Nutrient Objectives									
Proposed Objectives for Nutrients		Total Phosphorus (mg/L)		Total Dissolved Phosphorus (mg/L)		Total Nitrogen (mg/L)	
Alberta - Saskatchewan Boundary							
Battle River Near Unwin	Open Water	0.267	0.335	0.051		2.260	
	Ice Covered	0.075	0.100	0.045		1.550	
Beaver River at Beaver Crossing	Open Water	0.171		0.043	0.060	1.140	
	Ice Covered	0.127		0.042	0.060	1.862	
Cold River at Outlet of Cold Lake	Open Water	0.023		0.010		0.453	0.460
	Ice Covered	0.024		0.017		0.452	0.467
North Saskatchewan River at Highway 17	Open Water	0.253	0.278	0.026	0.046	1.169	1.230
	Ice Covered	0.063	0.115	0.048	0.101	1.175	1.225
Red Deer River Near Bindloss	Open Water	0.315	0.563	0.023	0.035	2.320	
	Ice Covered	0.035	0.069	0.008	0.024	0.860	
South Saskatchewan River	Open Water	0.159	0.246	0.014	0.018	1.073	1.114
	Ice Covered	0.054	0.110	0.010	0.067	1.638	1.771
Nutrient Objectives							
Proposed Objectives for Nutrients		Total Phosphorus (mg/L)		Total Dissolved Phosphorus (mg/L)		Total Nitrogen (mg/L)	
Saskatchewan - Manitoba Boundary							
Assiniboine River at Hwy 8 Bridge	Open Water	0.311		0.186		1.801	
	Ice Covered	0.180		0.115		2.252	
Carrot River near Turnberry	Open Water	0.099	0.140	0.027	0.057	1.087	1.417
	Ice Covered	0.170	0.266	0.031	0.059	1.814	2.052
Churchill River below Wasawakasik	Open Water	0.025		0.010		0.484	
	Ice Covered	0.021		0.010		0.411	
Qu'Appelle River	Open Water	0.278	0.304	0.156	0.190	1.822	
	Ice Covered	0.221	0.290	0.129	0.249	1.767	
Red Deer River at Erwood	Open Water	0.052	0.066	0.021	0.029	1.195	
	Ice Covered	0.074	0.161	0.025	0.055	1.998	
Saskatchewan River	Open Water	0.088	0.124	0.014	0.018	0.838	
	Ice Covered	0.028	0.034	0.011	0.017	0.761	

No Trend - 90th % of Database
90th % of Database
Decreasing Trend - Lowest 90th % of 10yr Running
Increasing Trend - Lowest 90th % of 10yr Running

APPENDIX 2: WATER QUALITY MONITORING

The water quality monitoring program is provided in the attached table and includes the previous monitoring program (2014) and the recommended 2015 monitoring program. The changes to be implemented for 2015 from 2014 are highlighted.

In 2015, pesticide sampling is recommended on the Battle River and the Red Deer River (A/S) in addition to the annual sampling at the Carrot and Assiniboine Rivers. The COWQ in 2013 also recommended that the acid herbicide pesticides be sampled on the Battle River and South Saskatchewan River due to a number of detections of these pesticides on these two rivers. The Committee recommends that acid herbicide sampling continue on the South Saskatchewan River in 2015. The Committee has also recommended that additional acid herbicide analysis be requested for the Qu'Appelle River and the Saskatchewan River due to higher detections of these pesticides on these two rivers.

PPWB MONITORING 2015: A/S Sites

SITE	NUTRIENTS & PHYSICALS; MAJOR IONS/SAR; METALS (Total and Dissolved); BACTERIA (Fecal & E. Coli)	PESTICIDES (AH, NH, OC's, Glyphosate)
Site 1 Cold River	2015 : 12x / year 2014 : 12x / year	2015: none 2014 : 8x/year[1]
Site 2 Beaver River	2015 : 12x / year 2014 : 12x / year	2015 : none 2014: none
Site 3 North Saskatcewan River	2015 : 12x / year 2014 : 12x / year	2015 : none 2014 : 8x/year[1]
Site 4 Battle River	2015 : 12x / year 2014: 12x / year	2015: 8x/ year[1] 2014 : 8x/year[2]
Site 5 Red Deer River A/S	2015 : 12x / year 2014 : 12x / year	2015 : 8x/ year[1] 2014 : none
Site 6 South Saskatchewan River	2015 : 12x / year 2014 : 12x / year	2015 : 8x/year[2] 2014 : 8x/year[1]

[1]Months sampled = Feb, Apr, May, June, July, Aug, Oct, Dec
[2]Pesticides = Acid Herbicides (AH) only;
Pesticides: (AH = Acid Herbicides; NH = Neutral Herbicides; OC's = Organochlorine)

APPENDIX 2: WATER QUALITY MONITORING

PPWB MONITORING 2015: S/M Sites

SITE	NUTRIENTS & PHYSICALS; MAJOR IONS/SAR; METALS (Total and Dissolved); BACTERIA (Fecal & E. Coli)	PESTICIDES (AH, NH, OC's, Glyphosate)
Site 7 Churchill[1]	2015 : 4x / year 2014 : 4x / year	2015: none 2014: none
Site 8 Saskatchewan River	2015: 12x / year 2014: 12x / year	2015: none 2014: none
Site 9 Carrot River	2015: 12x / year 2014: 12x / year	2015: 12x / year 2014: 12x / year
Site 10 Red Deer River S/M	2015: 12x / year 2014: 12x / year	2015 : none 2014 : none
Site 11 Assiniboine River	2015 : 12x / year 2014 : 12x / year	2015 : 12 x / year 2014 : 12 x/ year
Site 12 Qu'Appelle River	2015 : 12x / year 2014 : 12x / year	2015 : none 2014 : none

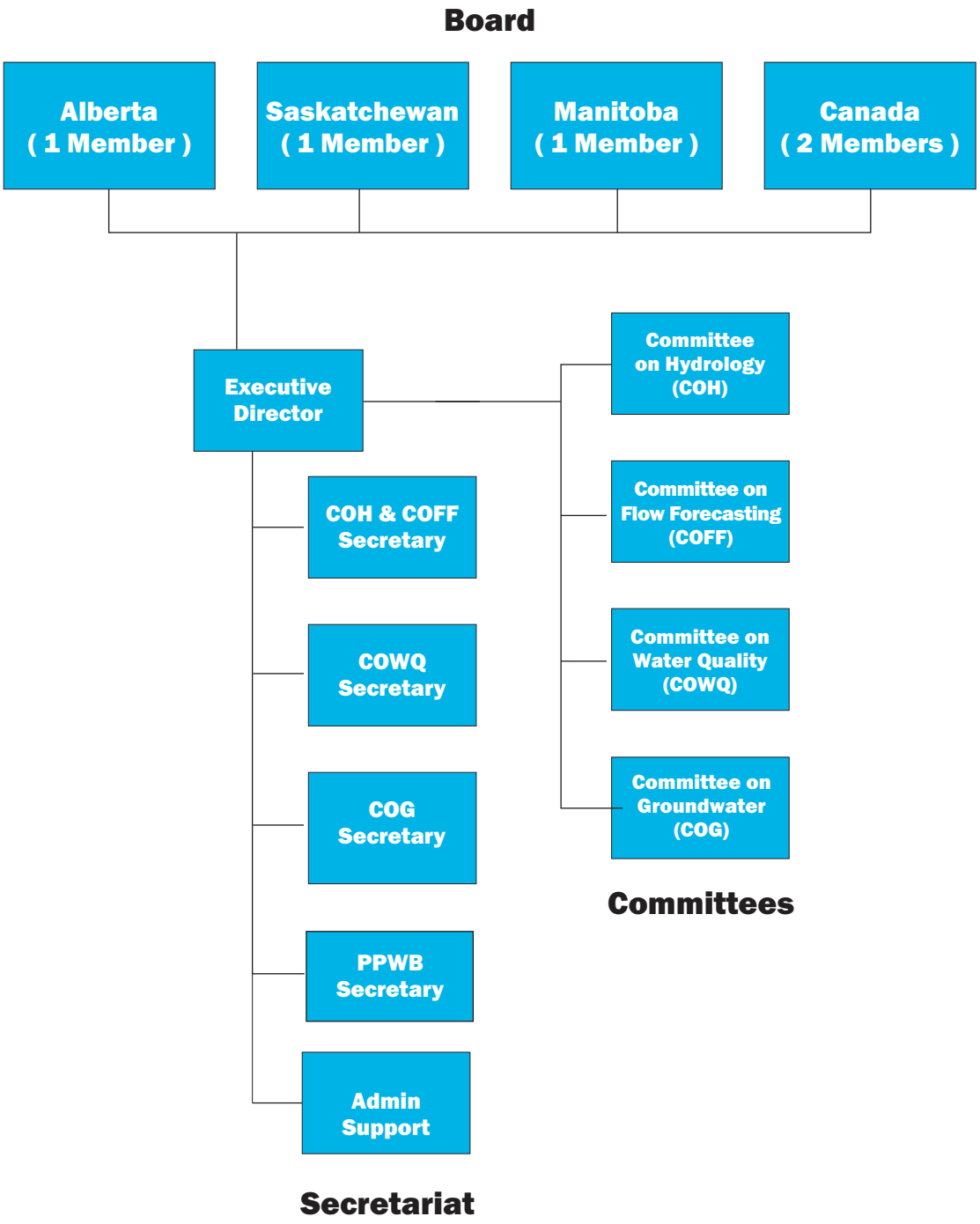
[1] Months sampled = Feb, May, July, Oct;
[2] Months sampled = Feb, Apr, May, June, July, Aug, Oct, Dec
Pesticides: (AH = Acid Herbicides; NH = Neutral Herbicides; OC's = Organochlorine)

Other Objectives

Monitoring is not recommended for radionuclides, total residual chlorine, cyanide and mercury in 2015. Water quality objectives are available in Schedule E for radionuclides, total residual chlorine, cyanide and mercury. However, these water quality objectives were included in Schedule E in the event of a future water quality issue or emergency but are not intended to be routinely monitored due to low risk. For example, radionuclides have not been monitored since January 1984.

Monitoring is not recommended for contaminants in fish in 2015. The historical data set of contaminants in fish for the transboundary sites has been compiled and is currently being reviewed by the Committee. Any future fish monitoring program will reflect the results of the previous program.

APPENDIX V: PPWB Organizational Chart



APPENDIX VI: Board / Committee Membership 2015 - 2016

PRAIRIE PROVINCES WATER BOARD

Manitoba, Saskatchewan, Alberta and Canada agree to establish and there is hereby established a Board to be known as the Prairie Provinces Water Board to consist of five members to be appointed as follows:

(a) two members to be appointed by the Governor General in Council, one of whom shall be Chairman of the Board, on the recommendation of the Minister of Energy, Mines and Resources,

(b) one member to be appointed by the Lieutenant Governor in Council of each of the Provinces of Manitoba, Saskatchewan and Alberta.

Schedule C, Section 1
Master Agreement on Apportionment

PPWB BOARD MEMBERS

CHAIR	Cheryl Baraniecki (Beginning Jun/15)	Associate Regional Director General West & North Environment and Climate Change Canada (formerly Environment Canada)
	Richard Smith (Jun/14 to Jun/15)	A/Associate Regional Director General West & North Environment and Climate Change Canada (formerly Environment Canada)
	Lynden Hillier	Director General Asset Management and Capital Planning Corporate Management Branch Agriculture and Agri-Food Canada
	Brian Yee	Director Transboundary Waters Secretariat Alberta Environment and Parks
	Steve Topping	Executive Director Manitoba Infrastructure (formerly Manitoba Infrastructure and Transportation)
	Jim Gerhart (May/12 to Sept/15)	Associate Executive Director Water Security Agency (Saskatchewan)

SECRETARIAT

EXECUTIVE DIRECTOR	Mike Renouf	Transboundary Waters Unit Environment and Climate Change Canada (formerly Environment Canada)
SECRETARY	Lynne Quinnett-Abbott	Transboundary Waters Unit Environment and Climate Change Canada (formerly Environment Canada)

PPWB ALTERNATE BOARD MEMBERS

Vacant	Environment and Climate Change Canada (formerly Environment Canada)
Dave Zapshala (Beginning Feb/16)	Director, Water Infrastructure Division Corporate Management Branch Agriculture and Agri-Food Canada
Scott Roy (Apr/13 to July/15)	Director, Water Infrastructure Division Corporate Management Branch Agriculture and Agri-Food Canada
Carmen de la Chevrotière	Transboundary Water Quantity Specialist Transboundary Waters Secretariat Alberta Environment and Parks
Susan Ross (Beginning Aug/15)	Senior Vice President Legal, Regulatory and Aboriginal Affairs Division Water Security Agency (Saskatchewan)
Bill Duncan (May /12 to Apr/15)	Executive Director Engineering and Geoscience Division Water Security Agency (Saskatchewan)
Nicole Armstrong	Director Water Science and Management Branch Department of Sustainable Development (Manitoba) (formerly Manitoba Conservation and Water Stewardship)

COMMITTEE ON HYDROLOGY

Terms of Reference: Mandate

At the request of, and under the direction of the PPWB, the Committee on Hydrology (COH) shall investigate, oversee, review, report and recommend on matters pertaining to hydrology of interprovincial or interjurisdictional basins.

The committee may consider such things as natural flow; forecasting; network design; collection, processing and transmission of data; basin studies and other items of interprovincial interest involving hydrology.

The COH will engage the Committee on Groundwater and the Committee on Water Quality on items of mutual interest or when the expertise of those committees will assist the COH.

PPWB Board Minute 92-65 (Oct. 7, 2009)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Malcolm Conly	Hydrometric Operations Environment and Climate Change Canada, Hydrometric (formerly Environment Canada)
	Ron Woodvine	Corporate Management Branch Agriculture and Agri-Food Canada
	Carmen de la Chevrotière	Transboundary Waters Secretariat Alberta Environment and Parks
	Mark Lee	Surface Water Management Section Department of Sustainable Development (Manitoba) (formerly Manitoba Conservation and Water Stewardship)
	Bart Oegema	Hydrology and Groundwater Services Water Security Agency (Saskatchewan)
	Anthony Liu	Meteorological Service of Canada Environment and Climate Change Canada, Meteorological (formerly Environment Canada)
SECRETARY	Megan Garner	Transboundary Waters Unit Environment and Climate Change Canada (formerly Environment Canada)

COMMITTEE ON WATER QUALITY

Terms of Reference: Mandate

Under the direction of the Prairie Provinces Water Board (PPWB), the Committee on Water Quality (COWQ) shall investigate, oversee, review, report, recommend and advise the Board on matters pertaining to the water quality and aquatic ecosystem integrity of interprovincial waters.

The responsibilities of the committee shall include directing, planning, and coordinating a water quality monitoring and trend assessment program by identifying monitoring requirements and overseeing transboundary monitoring and synoptic surveys. The committee shall promote an ecosystem approach to water quality management and the protection and enhancement of interprovincial waters by ensuring the compatibility of water quality guidelines, objectives, sampling and analytical protocols, monitoring approaches, quality assurance and data bases. It shall interpret data and identify, investigate and define existing and potential interprovincial water quality problems through the application of PPWB Water Quality Objectives, trend assessment and other approaches. The committee shall inform the Board and member agencies, through the PPWB contingency plan, of any spills or unusual water quality conditions that have the potential to adversely affect interprovincial streams. It shall assess the implications of these problems and may recommend remedial or preventative measures for avoiding and resolving water quality issues and if required, additional synoptic water quality monitoring.

The committee shall foster awareness and understanding of the importance of effective water quality management, encourage the use of "state of the art" procedures for evaluating water quality and identify research needs pertinent to water quality management on the prairies. The committee shall facilitate effective water quality management practices through integration of agency initiatives and the promotion of joint planning on interprovincial streams.

The COWQ will engage the Committee on Hydrology and the Committee on Groundwater on items of mutual interest or when the expertise of those committees will assist COWQ.

PPWB Board Minute 92-65 (Oct. 7, 2009)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Paul Klawunn	Science and Technology Branch Environment and Climate Change Canada (formerly Environment Canada)
	Nicole Armstrong	Water Science and Management Branch Department of Sustainable Development (Manitoba) (formerly Manitoba Conservation and Water Stewardship)
	John-Mark Davies	Water Quality Services Water Security Agency (Saskatchewan)
	Gongchen Li	Transboundary Waters Secretariat Alberta Environment and Parks

	Sharon Reedyk	Science and Technology Branch Agriculture and Agri-Food Canada
SECRETARY	Joanne Sketchell	Transboundary Waters Unit Environment and Climate Change Canada (formerly Environment Canada)

COMMITTEE ON GROUNDWATER

Terms of Reference: Mandate

Recognizing the inter-relationship between surface and groundwater, the Committee on Groundwater shall, at the request of, and under the direction of the Prairie Provinces Water Board, investigate, oversee, review, report, and recommend on matters pertaining to quantity and quality of groundwater at or near interprovincial boundaries.

Responsibilities of the committee may include: exchange of information; compilation and interpretation of existing data; recommendations on groundwater information and monitoring requirements; determination of implications of proposed projects which may impact the quantity and/or quality of waters at interprovincial boundaries; and other items of interjurisdictional interest involving groundwater.

The COG will engage the Committee on Hydrology and the Committee on Water Quality on items of mutual interest or when the expertise of those committees will assist the COG.

PPWB Board Minute 92-65 (Oct. 7, 2009)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Garth van der Kamp	Groundwater Hydrology Water Science and Technology Directorate Environment and Climate Change Canada (formerly Environment Canada)
	Anthony Cowen	Science and Technology Branch Agriculture and Agri-Food Canada
	Steve Wallace	Groundwater Policy Alberta Environment and Parks
	Kei Lo	Hydrology and Groundwater Services Water Security Agency (Saskatchewan)
	Graham Phipps	Groundwater Section Department of Sustainable Development (Manitoba) (formerly Manitoba Conservation and Water Stewardship)
SECRETARY	Megan Garner (2014 to Aug-15)	Transboundary Waters Unit Environment and Climate Change Canada (formerly Environment Canada)
	Jackie Luckey (Beginning Sept-15)	Transboundary Waters Unit Environment and Climate Change Canada (formerly Environment Canada)

COMMITTEE ON FLOW FORECASTING

Terms of Reference: Mandate

At the request of, and under the direction of the Prairie Provinces Water Board (PPWB), the Committee on Flow Forecasting (COFF) shall investigate, oversee, review, report and improve the accuracy of flow forecasting at the interprovincial boundaries; and, recommend on matters pertaining to streamflow forecasting of interprovincial basins.

The committee may consider such things as flow forecasting methods, hydraulic and hydrologic basin forecast models, tools and techniques, inter-jurisdictional communications, provision and transmission of data, studies, and other items of interprovincial interest involving streamflow forecasting.

The COFF will engage the Committee on Hydrology, Committee on Groundwater and the Committee on Water Quality on items of mutual interest or when the expertise of those committees will assist the COFF.

PPWB Board Minute 115-27 (November 2-3, 2015)

CHAIR	Mike Renouf	Executive Director Prairie Provinces Water Board
MEMBERS	Bruce Davison	National Hydrologic Services Meteorological Service of Canada (Hydrology) Environment and Climate Change Canada (formerly Environment Canada)
	Anthony Liu	Meteorological Service of Canada (Meteorology) Environment and Climate Change Canada (formerly Environment Canada)
	Patrick Cherneski	National Agroclimate Information Services Agriculture and Agri-Food Canada
	Fisaha S. Unduche	Hydrologic Forecasting & Coordination Manitoba Infrastructure
	Curtis Hallborg	Flow Forecasting & Operations Planning Water Security Agency (Saskatchewan)
	Bernard Trevor	Watershed Resilience and Mitigation Alberta Environment and Parks
SECRETARY	Megan Garner	Transboundary Waters Unit Environment and Climate Change Canada

APPENDIX VII: Statement of Final Expenditures 2015 - 2016

	2015/16	
	Budget	**Actual**
Salary Component		
PY's	5.600	5.060
Base Salary	$524,732	$440,847
BPE	$104,900	$88,169
Total Salary	$629,632	$529,016
O&M Component		
Contracts & Students		
Goal 1		
Cont. Improvement	$145,000	$42,981
Modernization*	$50,000	$44,570
Goal 3		
Cont. Improvement	$130,000	$98,543
Goal 7		
Modernization	$15,000	$0
Goal 8		
Core Activities	$17,000	$0
Sub-total Contracts	$307,000	$141,524
Operating Expenses	$40,000	$36,272
Total O&M	$347,000	$177,796
Grand Total	$976,632	$706,812

APPENDIX VIII: History of the PPWB

The Prairie Provinces Water Board was formed on July 28, 1948 when Canada and the Provinces of Alberta, Saskatchewan, and Manitoba signed the Prairie Provinces Water Board Agreement. This Agreement established a Board to recommend the best use of interprovincial waters, and to recommend allocations between provinces.

From 1948 to 1969, the Engineering Secretary to the Board was a Prairie Farm Rehabilitation Administration employee. The support staff for studies and office accommodation during these years was provided by the PFRA in Regina at no charge.

After twenty years, changes in regional water management philosophies resulted in a need to modify the role of the Board. Consequently, the four governments entered into the *MAA* on October 30, 1969. This Agreement provided an apportionment formula for eastward flowing interprovincial streams, gave recognition to the problem of water quality, and reconstituted the Prairie Provinces Water Board.

The *MAA* has five schedules which form part of the Agreement. These Schedules are:

1. Schedule A. An apportionment agreement between Alberta and Saskatchewan.

2. Schedule B. An apportionment agreement between Saskatchewan and Manitoba.

3. Schedule C. The Prairie Provinces Water Board Agreement describes the composition, functions and duties of the Board.

4. Schedule D. A list of Orders-in-Council for allocations of interprovincial waters made before 1969.

5. Schedule E. A Water Quality Agreement describes the role of the PPWB in interprovincial water quality management and established Water Quality Objectives for 12 interprovincial river reaches. This Schedule became part of the Master Agreement in 1992 and was updated in 2015.

Under Schedule C, the Prairie Provinces Water Board was reconstituted and was given the responsibility of administering the agreement. Schedule C also provided for the necessary board staff, accommodation, and supplies to be jointly financed by the four participating governments. Following the reconstitution of the PPWB, the members also agreed to the establishment of a semi-autonomous Board Secretariat.

The PPWB's change in administration policy was implemented when an Executive Director was appointed on July 1, 1972. The By-laws, and Rules and Procedures also came into effect on this date.

On April 2, 1992, the *MAA* was amended to include a Water Quality Agreement that became Schedule E to the Master Agreement. The Agreement sets interprovincial water quality objectives at 11 transboundary river reaches and commits each of the Parties to take reasonable and practical measures to maintain or improve existing water quality. In June 2015, Schedule E was updated to include 71 water quality objectives at 12 transboundary river reaches.

The 1992 amendment to the *MAA* also included the addition of a clause that refer groundwater matters to the Board. The addition of Clause 6.1 facilitates cooperative management of interprovincial aquifers to ensure their protection and sustainable use.

At the Board's March 1995 meeting, the Board agreed that full time Secretariat staff was no longer necessary and that functional support would be provided by staff of Environment and Climate Change Canada (formerly Environment Canada). The process of disbanding the PPWB Secretariat and integrating its functions into Environment and Climate Change Canada was completed during 1995 - 1996. The portion of time each Environment and Climate Change Canada staff person spends on PPWB activities is charged to the PPWB and cost-shared by the members.

The Board currently operates through its Executive Director, supported by four standing committees the Committee on Hydrology, the Committee on

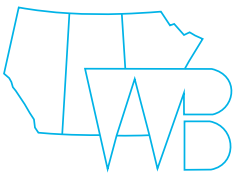
Groundwater, the Committee on Water Quality and the newly formed Committee on Flow Forecasting.

The Board approves an annual PPWB budget with one-half the operating budget being provided by Canada and one-sixth by each of the three provinces. The Government of Canada is responsible to conduct and pay for the costs of water quantity and quality monitoring.

In November 2015, a costed multi-year Work Plan was renewed and approved by the Board to identify activities and projected budgets for 2016 - 2021. Activities in this Work Plan are directed to achieving the goals that were identified in the 2006 Strategic Plan that fulfill the vision, mission and key deliverables that are outlined in the 2006 Charter. Activities are targeted towards assessing whether the commitments made in the *MAA* have been met by the Signatory Parties (Government of Canada, and Provinces of Alberta, Saskatchewan and Manitoba).

The 2006 PPWB Charter and Strategic Plan were reviewed in 2012 as part of the Work Plan review. These documents were approved at the fall 2012 Board Meeting.

In February 2009, the *MAA,* By-laws, and Rules and Procedures were published in an updated document that included all changes made to date. The By-Laws and Rules and Procedures, along with other key PPWB documents began a review in 2014 - 2015. The review is expected to be ongoing for the next couple of years.



Prairie Provinces Water Board
2365 Albert Street, Room 300
Regina, Saskatchewan
S4P 4K1
www.ppwb.ca