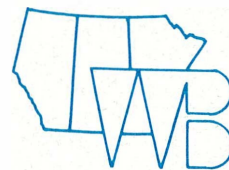


# ANNUAL REPORT • 1994

CANADA - ALBERTA - SASKATCHEWAN - MANITOBA

**PRAIRIE  
PROVINCES  
WATER  
BOARD**





**PRAIRIE  
PROVINCES  
WATER  
BOARD**



**ANNUAL REPORT**  
FOR THE YEAR ENDING MARCH 31, 1995



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## LETTER OF TRANSMITTAL

September 1995

Honourable Sheila Copps  
Minister of the Environment  
Ottawa, Canada

Honourable Eldon Lautermilch  
Minister Responsible for  
Saskatchewan Water Corporation  
Regina, Saskatchewan

Honourable Ty Lund  
Minister of Environmental  
Protection  
Edmonton, Alberta

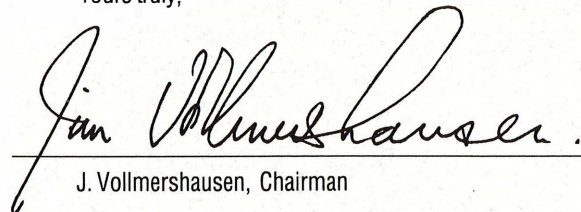
Honourable Albert Driedger  
Minister of Natural Resources  
Winnipeg, Manitoba

Honourable Ralph Goodale  
Minister of Agriculture and Agri-Food  
Ottawa, Ontario

Honourable Ministers:

On behalf of the members of the Prairie Provinces Water Board, it is my pleasure to submit herewith the Annual Report of the Prairie Provinces Water Board for the fiscal year ending March 31, 1995.

Yours truly,



J. Vollmershausen, Chairman

## MESSAGE FROM THE EXECUTIVE DIRECTOR

This year marks the twenty fifth anniversary of the signing of the Master Agreement on Apportionment in October 1969. That agreement has provided the successful basis for the sharing and protection of interprovincial waters in a water-short region. The agreement and, more over, the Board members responsible for administering the agreement, have created a cooperative collaboration between agencies extending well beyond the agreement itself. As a result, the PPWB is recognized as the most significant interjurisdictional water management arrangement in Canada.

During 1994/95, Alberta and Saskatchewan met all apportionment requirements for interprovincial streams. On the South Saskatchewan River, Alberta delivered 80.7 % of the total annual flow and met minimum flow criteria at all times. Alberta also met its apportionment obligations for Cold Lake by passing 98.6 % of the natural outflow of the Lake to Saskatchewan.

Because the Master Agreement on Apportionment states that apportionment should be equitable but did not define the term equitable, the Board requested a report on what equitable apportionment means and how it is achieved. The Committee on Hydrology completed a report on the concept of equitable apportionment which the Board will consider in 1995/96.

In response to budget constraints, the Committee on Hydrology was requested to undertake a detailed review of the South Saskatchewan and Qu'Appelle River monitoring programs. A report on the South Saskatchewan Basin was approved by the committee. That report contained a number of recommendations to improve the current procedures to compute the apportionable flow of the South Saskatchewan River and to the list of hydrometric stations. The committee also considered a draft report on the Qu'Appelle River basin.

The Committee on Groundwater completed its groundwater vulnerability mapping project during the year. This project, which was coordinated by the National Hydrology Research Institute, maps the vulnerability of the upper most aquifers along the interprovincial boundaries to potential sources of contamination at or near the surface. The maps will be available for distribution in May 1995.

Because of the significant amount of groundwater used in heavy oil production and its importance in the water balance of Cold Lake, the Committee on Groundwater evaluated the effects of groundwater withdrawals on Cold Lake and the need to include groundwater in apportionment calculations. A report will be provided to the Committee on Hydrology for consideration at its 1995 fall meeting.

The PPWB Water Quality Contingency Plan, a communication plan used to inform Board agencies of spills and unusual water quality conditions, was modified to include events that have the potential to affect interprovincial aquifers.

Water quality of interprovincial streams continued to be good, with 94% adherence to the PPWB Water Quality objectives.

The Secretariat completed water quality trend reports at 11 interprovincial sites. Trend analysis assists in the early detection of changes in water quality. The trend results together with the results of a monitoring frequency study of the North Saskatchewan River were used to revise the PPWB Water Quality Monitoring program.

As the PPWB enters its next 25 years, it will be adjusting to new ways in how it operates. At the March 1995 PPWB meeting, the Board agreed to disband the PPWB Secretariat and have Environment Canada take over the secretariat functions. While this will create some new challenges, the Board will no doubt effectively continue its work of overseeing the Master Agreement and promoting cooperative interprovincial water management.



R.L. Kellow  
Executive Director



## INTRODUCTION

This report summarizes the activities and the progress of the Prairie Provinces Water Board (PPWB), its committees, and the Secretariat for the period April 1, 1994 to March 31, 1995.

The Board met twice during 1994/95; on October 12, 1994 in Winnipeg, Manitoba and in Regina, Saskatchewan on March 15, 1995. The Board also held a Workshop on February 9, 1995 to discuss the future of the Board.

A total of six committee meetings were held throughout the year: the Committee on Hydrology (COH), the Committee on Water Quality (COWQ), and the Committee on Groundwater (COG) each met twice during the year.

### HISTORY

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. During the next 22 years (1948 to 1969 inclusive), the Engineering Secretary to the Board was a Prairie Farm Rehabilitation Administration (PFRA) employee. The support staff for studies, and office accommodation during these years were provided by the PFRA in Regina at no charge.

On October 30, 1969, Canada and the three provinces entered into an agreement to share the flow and to consider the quality of eastward

flowing interprovincial streams. Under Schedule C of that Master Agreement on Apportionment, the Prairie Provinces Water Board was reconstituted and was given the responsibility to administer 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 Board, as shown in the organization chart in Appendix II, now operates through the Executive Director and staff, supported by three standing committees. The by-laws, rules and procedures also became effective on this date.

The employees of the Secretariat, for administrative purposes, are classified as federal public servants but receive direction entirely from the Board. The Board directly controls the operation of the Secretariat through approval of an annual budget. It currently has federal spending authority up to an annual maximum of \$625,000 from funds provided under the Canada Water Act administered by Environment Canada. The

provincial governments' share of expenditures are recovered each fiscal year.

On April 2, 1992, the Master Agreement on Apportionment was amended to include a water quality agreement which became Schedule E to the Master Agreement. The agreement sets water quality objectives at 11 interprovincial river reaches and commits each of the parties to take reasonable and practical measures to maintain or improve existing water quality.

At the Board's March 1995 meeting, the Board agreed that the Secretariat functions will be provided by Environment Canada. The process of disbanding the PPWB Secretariat and integrating its functions into Environment Canada will be done during 1995/96.

### SECRETARIAT OPERATION

The PPWB Secretariat is located in Room 201, 2050 Cornwall Street, Regina, Saskatchewan. There were six permanent employees on staff during the fiscal year. Financial, administrative and personnel services are provided through the staff of Environment Canada, Prairie and Northern Region.

## BOARD AND COMMITTEE ACTIVITIES

### WATER QUANTITY

#### MONITORING RESPONSIBILITIES

The 1969 Master Agreement on Apportionment directs "...that the Prairie Provinces Water Board shall monitor and report on the apportionment of waters set out in the provisions of the first and second agreements and ratified by the Master Agreement".

In fulfilling the terms of this agreement, Environment Canada on behalf of the Prairie Provinces Water Board, monitors streamflow at several hydrometric sites. Data gathered are used by the PPWB to determine natural streamflows for apportionment purposes.

During 1994/95 the Committee on Hydrology (COH) reviewed the hydrometric network to ensure changing use patterns were appropriately monitored to allow computation of natural flow. As of March 31, 1995, 112 stations were required for computational purposes. These are plotted on the map at the end of this report.

The committee also confirmed the continuing need for 28 Environment Canada meteorological monitoring stations in the three prairie provinces. These sites provide information for computing natural flow at the interprovincial boundaries.

At its March 15, 1995 meeting, the Board approved the 1995/96 list of PPWB hydrometric and meteorological monitoring stations as recommended by the COH.

Quarterly reports on natural flows, consumptive uses and storage changes for the South Saskatchewan River basin in Alberta were prepared and distributed. The total annual recorded flow of 5 678 000 cubic decameters (dam<sup>3</sup>) in the South Saskatchewan River, at the point below its junction with the Red Deer River, represented 80.7 percent of the total annual natural flow of 7 038 000 dam<sup>3</sup>. A summary of recorded and natural flow volumes for 1994 at this apportionment point is shown in table and graph form on pages 20 and 21.<sup>1</sup>

Due to the ice problems, the combined recorded flow for the South Saskatchewan River at Medicine Hat and Red Deer River near Bindloss dropped below 42.5 m<sup>3</sup>/sec (1500 cfs) for the period November 22nd-26th, and on November 28, 1994. To ensure that the minimum flow requirement was not violated, the Surface Water Assessment Branch, Alberta Environmental Protection provided the Secretariat with estimated natural flow for the low flow period. Natural flow for the low flow period was about 58 m<sup>3</sup>/sec

and more than 50% of the daily natural flow was passed to Saskatchewan.

The natural flow of the Qu'Appelle River at the Saskatchewan-Manitoba boundary between April 1, 1994 and March 31, 1995 was 349 675 dam<sup>3</sup>. Recorded flow augmented by releases of 64 962 dam<sup>3</sup> from Lake Diefenbaker, was 430 810 dam<sup>3</sup>. Recorded and natural flows covering April 1, 1994 to March 31, 1995 are shown on page 22.

Environment Canada continued to provide the Secretariat with hydrometric information needed for computing natural flow of Battle, Lodge and Middle Creeks for apportionment purposes. Apportionment balance reports were prepared and distributed to PPWB agencies three times during 1994. More than 75 percent of natural flow at the interprovincial boundary for Battle, Lodge and Middle Creeks was passed to Saskatchewan. Flow data for these three creeks are shown on page 23.

Natural flows for the South Saskatchewan River basin were calculated using the project depletion method, while natural flows for the Qu'Appelle River basin were determined using the "Streamflow Synthesis and Reservoir Regulation" (SSARR)

<sup>1</sup>The apportionment period of volumetric flow between Alberta and Saskatchewan is the calendar year, while the apportionment period between Saskatchewan and Manitoba is from April 1 of each year to March 31 of the following year.



model. Both procedures have been approved by the Board.

Natural flows were also calculated for the North Saskatchewan River, Saskatchewan River and Churchill River at the interprovincial boundaries. Monthly recorded and natural flows for the apportionment period at these sites, as well as recorded flows at five additional boundary sites, are shown in the tables on pages 22 and 23.

In addition to the apportionment monitoring activities described above, the Secretariat periodically checked the apportionment balance of the Pipestone Creek at the Saskatchewan-Manitoba boundary. This information was provided to the Saskatchewan Water Corporation and Manitoba Water Resources Branch for management purposes. From April 1, 1994 to March 31, 1995, the recorded flow for the Pipestone Creek at the boundary was 32 726 dam<sup>3</sup> - an excess flow of 24 377 dam<sup>3</sup>.

The Board, at its March 1994 meeting, reviewed a COH draft report entitled "Interprovincial Lakes Apportionment Study" and agreed that the Rational Method and accompanying provisions described in that report be used for apportioning the Cold Lake basin. In accordance with the

Rational Method, the computed percentage of Cold Lake's natural outflow that each province is entitled to is 31.6% for Alberta, 43.4% for Saskatchewan, and 25% of Manitoba.

Natural outflow at the outlet of Cold Lake was computed periodically during 1994 to determine if Saskatchewan had received its fair share of flow from Cold Lake. Based on the information provided by Environment Canada and Alberta Environmental Protection, recorded outflow for the period January to December of 1994 was 184 300 dam<sup>3</sup>, 98.6% of the natural outflow of 186 900 dam<sup>3</sup>.

#### **COMMITTEE ON HYDROLOGY**

The Committee on Hydrology met twice during the year; on September 20-21, 1994 in Edmonton, Alberta and on January 23-24, 1995 in Regina, Saskatchewan.

During these meetings, the committee discussed and finalized a report entitled "Interprovincial Lakes Apportionment Study" which provided an inventory of interprovincial lakes in the prairie provinces, and suggested a method for apportioning the water of interprovincial lakes. The committee also approved a procedure for computing natural

outflow of Cold Lake for apportionment purposes.

At the request of the Board, the committee prepared a report on the interpretation of the concept of equitable apportionment as set out in the Master Agreement on Apportionment. During the process of report preparation, the committee considered legal views and international law. A draft report entitled "Equitable Apportionment: A Primer" was completed in January 1995. The report has been submitted to the Board for its consideration.

The committee, in January 1994, completed a report entitled "Hydrometric Monitoring Strategy" (PPWB Report No. 127) which was subsequently accepted by the Board at its March 1994 meeting. The report recommended that an apportionment network analysis for the South Saskatchewan River basin be conducted by Alberta Environmental Protection and the Qu'Appelle River basin be conducted by Sask Water. The report also recommended general criteria for determining the appropriate level of monitoring to be used for small basins currently not apportioned.

At its January 1995 Meeting, the COH approved the report "Assessment of Procedures and Monitoring Requirements for

Administrating the Master Agreement in the South Saskatchewan River". The report contains a number of recommendations to improve the current procedures to compute the apportionable flow in the South Saskatchewan River as well as some changes to the list of hydrometric stations. The report also recommended that the need for a continuous simulation model be examined on an annual basis because of the inadequacy of the existing procedures to administer the minimum flow provisions of the Master Agreement.

The Committee also reviewed a draft report entitled "Qu'Appelle River Apportionment Review". The committee noted that while present water use in the Saskatchewan portion of the Qu'Appelle River basin is less than the diversion from Lake Diefenbaker, apportionment monitoring is important to demonstrate that more than 50% of annual natural flow is passed to Manitoba. While the committee agreed with the report's recommendation to replace the existing SSARR natural flow model with an annual water balance method the report required further revisions.

A question was raised at the September 1994 committee meeting as to whether the

apportionment period for interprovincial streams crossing the Saskatchewan-Manitoba boundary should be revised from the water year (April 1 to March 31 in the following year) to a calendar year. In response to this question, the Secretariat prepared a report entitled "Apportionment Period for Eastward Flowing Streams Crossing the Saskatchewan-Manitoba Boundary". This report was discussed at the January 1995 committee meeting. The report provides background information as to why different apportionment time periods were specified in Schedules A and B of the Master Agreement, and an analysis on the effect of changing the apportionment period from water year to calendar year. The committee agreed that further investigations are required before making any recommendations to the Board.

The committee noted that Alberta Environmental Protection in cooperation with Environment Canada is undertaking a channel loss study in the Middle Creek basin. The results of the study will be used to obtain a new set of channel loss equations. The channel loss study will be completed in 1995/96. The committee agreed that the completion date for the Lodge and Middle Creeks natural flow study

be postponed until the channel loss study has been completed.

The committee noted that the last Prairie Hydrology Workshop was held in 1988, and agreed that another workshop to discuss technical matters related to Prairie Hydrology should be held. They also agreed the workshop should include water quality and groundwater considerations. The workshop is tentatively scheduled for the fall of 1995 in Saskatoon, Saskatchewan.

The committee noted that natural flow calculations for the Saskatchewan River at the Saskatchewan-Manitoba boundary requires nine hydrometric stations. In view of the current budget constraints, it was agreed that the Secretariat should conduct a review on the Saskatchewan River's apportionment monitoring network and prepare a paper for discussion at the September 1995 committee meeting.

With respect to PPWB Hydrometric Monitoring List for 1995/96, the committee suggested ten deletions, three additions and one replacement from the previous list. They also agreed that the 1995/96 meteorological list be the same as 1994/95.



## **STUDIES**

### **Lodge and Middle Creeks Natural Flow Study**

As suggested by the Committee on Hydrology, the Surface Water Assessment Branch of Alberta Environmental Protection is conducting a natural flow study for the Lodge and Middle Creeks basin to provide a more accurate estimate of historical monthly natural flows for these two creeks. A first draft report was reviewed by the COH at its March 1993 meeting. It is anticipated that a revised draft report will be prepared in 1995/96 after a channel loss study is completed. The results of the study will be used by the COH to determine strategies to minimize apportionment problems in these basins.

### **Concept of Equitable Apportionment**

Because the Master Agreement does not define the word "equitable", there has been some uncertainties as to what "equitable apportionment" means and how it is achieved. Therefore, the Board, at its March 1994 Meeting, directed the COH to prepare a report on the interpretation of the concept of equitable apportionment as set out in the Master Agreement on Apportionment. For the preparation of this document, the

committee was requested to consider legal views and international law. The committee also decided it would be useful to consult some previous Board and COH Members for advice. A draft report entitled "Equitable Apportionment: A Primer" has been submitted to the Board for its consideration.

### **Hydrometric Monitoring Network Evaluation Studies**

The Board, at its March 1994 meeting, approved a COH report entitled "Hydrometric Monitoring Strategy" and agreed with the report's recommendations that an apportionment network analysis for the South Saskatchewan River basin, and for the Qu'Appelle River basin. Alberta Environmental Protection, in January 1995, completed a report entitled "Assessment of Natural Flow Computation Procedures and Monitoring Network for Administering Apportionment of the South Saskatchewan River Basin at the Alberta-Saskatchewan Boundary". The report was reviewed and approved by the COH at its January 1995 meeting. Sask Water completed a draft report entitled "Qu'Appelle River Apportionment Review" which was reviewed by the COH at its January 1995 meeting. It is anticipated that this report will be finalized in 1995/96.

### **Apportionment of Interprovincial Lakes**

In response to concerns raised in 1991 regarding low water levels on Cold Lake, the Board at its spring 1992 meeting, directed the COH to review the Master Agreement on Apportionment and make recommendations on its applicability to interprovincial lakes. A draft report entitled "Interprovincial Lakes Apportionment Study" was presented to the Board at its March 1994 meeting. The recommendations pertain to how interprovincial lakes should be apportioned in general and Cold Lake in particular. The Board accepted the recommendations as presented by the COH, and asked the COH to revise the report to accommodate suggested changes made at the meeting. The report will be finalized in 1995/96.

### **Natural Flow Studies on Small Interprovincial Basin**

In 1975, the Board requested the Secretariat to define natural flow on small interprovincial river basins. Natural flow studies have since been carried out on all 21 small interprovincial basins. These basins are listed below. Updating of natural flow data for these rivers or creeks at interprovincial boundaries is carried out on a continuing basis.

### **ANNUAL WATER USE REPORT BOXELDER CREEK BASIN**

Boxelder Creek is part of an internal drainage basin straddling the Alberta-Saskatchewan boundary midway between Maple Creek, Saskatchewan and Medicine Hat, Alberta. Because of the complexity of the basin, including numerous diversions and the high percentage of natural flow allocated for water use, the PPWB has agreed that Boxelder Creek be treated as a special interprovincial basin. Available flow in this basin is to be jointly managed by Alberta and Saskatchewan.

Alberta and Saskatchewan annually collect sufficient water use data to provide an estimate of total consumption in the Boxelder Creek basin. This data is reported to the Board.

Total irrigation and municipal water use in the Alberta portion of the basin for 1994 was 6201 dam<sup>3</sup>. During the same period, the four provincial reservoirs stored 581 dam<sup>3</sup> and released 658 dam<sup>3</sup> to the Boxelder Creek system. Based on the responses of the 1994 water use survey, conducted by Sask Water, 1490 dam<sup>3</sup> were diverted for irrigation purposes in the Saskatchewan portion of the Boxelder Creek basin.

### **ANNUAL REPORT ON INTERPROVINCIAL DRAINAGE PROJECTS**

The Board accepted the Committee on Hydrology report "A Recommended Procedure to Deal with the Impact of Artificial Drainage on Downstream Flows" at its November 1983 meeting.

Board members agreed the COH should provide reports on drainage activities at future Board meetings.

In 1994 Saskatchewan licensed three new drainage projects and Alberta licensed 21 new drainage projects with potential interprovincial implications. Manitoba reported no projects with the potential to affect streams crossing interprovincial boundaries.

### **WATER USE**

In 1982 the PPWB completed a study of historical water uses in the prairies for the period 1951-1978. Information collected was used to establish a data base containing six sectors: regional economic base; municipal and industrial; agriculture; power generation; recreation; and environmental considerations.

The data base has been updated to 1991. This update provides information on population trends, as well as water use data for

Antler River  
Assiniboine River  
Battle River  
Beaver River  
Big Gully Creek  
Birch River  
Bosshill Creek

Boxelder Creek  
Elm Creek  
Eyehill Creek  
Gainsborough Creek  
Gopher Creek  
Graham Creek  
Jackson Creek

Mackay Creek  
Overflowing River  
Pipestone Creek  
Red Deer River (Sask.)  
Stony Creek  
Swan River  
Woody River



municipal, industrial, power and agricultural purposes.

### **SECRETARIAT ACTIVITIES**

The Secretariat is responsible for maintaining monthly natural flow estimates for selected hydrometric sites in the prairie provinces.

The Secretariat in 1993 took over the responsibility from Environment Canada of computing apportionment balance for the Lodge, Middle and Battle Creeks at the Alberta-Saskatchewan boundary. Three interim apportionment audit reports and one final report were prepared and distributed during the year.

The Secretariat also took over the responsibility of computing natural flow for the South Saskatchewan River in 1994. Natural flow computations before 1994 were done under contract by Environment Canada. During 1994/95, the Secretariat completed and circulated four audit reports and one final report of the South Saskatchewan River apportionment balance results.

Natural flow calculations for the Pipestone Creek at the Saskatchewan-Manitoba boundary has been carried out by the Secretariat using a computer program developed in 1984. In December 1992, Sask Water

completed a report entitled "Pipestone Creek Natural Flow at the Saskatchewan-Manitoba Boundary" which includes a natural flow calculation computer program for the Pipestone Creek. In July 1994, the Secretariat obtained the source program from Sask Water and converted the program into a microcomputer version. The new computer program will be used by the Secretariat for future computation of Pipestone Creek's natural flow.

### **GROUNDWATER**

#### **COMMITTEE ON GROUNDWATER**

The Committee on Groundwater met twice during the year; on May 4-5, 1994 in Saskatoon, Saskatchewan and November 23-24, 1994 in Winnipeg, Manitoba.

At the May 1994 meeting, the committee met with the Saskatchewan Research Council (SRC) to discuss the current activities of the SRC and a groundwater initiative proposal for the Panel on Energy Research and Development (PERD). The purpose of this proposed project is to develop a system to aid in resolving petroleum development problems related to groundwater in the Cold Lake region.

During the year, the committee completed its groundwater

vulnerability mapping project. That project consisted of mapping the contamination potential to the uppermost aquifer from surface or near surface sources using a methodology developed for the PPWB by the National Hydrology Research Institute. The project resulted in the preparation of ten color map sheets, six along the Alberta-Saskatchewan boundary and four along the Saskatchewan-Manitoba boundary. The map sheets will be available for distribution in early 1995-96.

With respect to a request by the Committee on Hydrology regarding the possibility of including groundwater in the apportionment of Cold Lake, the COG at its November 1994 meeting, reviewed a report entitled "Groundwater Apportionment in the Cold Lake Basin". The report was provided to the COH for its consideration. As a result of some comments by the COH, a revised report will be prepared in 1995-96.

The committee agreed that there is a need for it to more fully consider questions relating to apportionment of transboundary aquifers. Work on this project will begin in 1995/96.

The committee discussed the impact of Alberta special areas deep groundwater exploration study, and noted that there are

several buried channels that extend into Saskatchewan. The committee agreed that extending the Special Areas study to the Saskatchewan portion of the area be conducted under the PPWB aquifer management framework project, if funding becomes available.

The development and support of effective, long-term groundwater management policy requires high quality, relevant management data. The committee in discussing a procedure to develop a comprehensive and consistent groundwater data base for the prairie provinces agreed that PFRA is the agency most familiar with the groundwater data bases in the prairie provinces, and therefore agreed to request PFRA to prepare a report outlining the essential parameters that should be included in the provincial groundwater data bases. The committee noted that maps are important tools for groundwater management. It suggested a review of a series of frequently used groundwater related maps be conducted to determine what data parameters are needed to produce the required information. It is anticipated that this project will be completed in the fiscal year 1995/96.

The Committee on Groundwater, in consultation with the Committee on Water Quality, has revised the

PPWB Water Quality Contingency Plan to include groundwater considerations. The revised Contingency Plan was presented and approved at the October 1994 Board meeting. The plan was printed and circulated to the PPWB member agencies early in 1995.

Regarding the development of a groundwater allocation and protection data base in the prairie provinces, Alberta Environmental Protection provided the Secretariat with groundwater protection and allocation information for sites located near the Alberta-Saskatchewan boundary. Their information includes: active and inactive land disposal sites, underground storage tanks, pesticides, container sites, active groundwater projects, and waste management sites. These data have been entered into the PPWB groundwater allocation and protection data base.

## **STUDIES**

### **Groundwater Vulnerability Mapping**

The Board, at its October 20, 1992 meeting approved the preparation of groundwater vulnerability maps as outlined in the Committee on Groundwater report "Proposed Implementation Plan for Recommendations in the 1991 COG Report on Evaluation of Groundwater Legislations." The

objective of this project is to publish a series of maps at the interprovincial boundaries showing the potential for groundwater contamination from surface activities. The project uses a methodology developed by the National Hydrology Research Institute (NHRI) for the PPWB. The NHRI coordinated the project using data supplied by the provinces. Printing of the two reports "Groundwater Vulnerability Mapping Along the Alberta-Saskatchewan Boundary" (PPWB Report No. 128), and "Groundwater Vulnerability Mapping Along the Manitoba-Saskatchewan Boundary" (PPWB Report No. 137) was completed in March 1995.

## **WATER QUALITY**

### **COMMITTEE ON WATER QUALITY**

The Committee on Water Quality (COWQ) met on April 25-26, 1994 in Saskatoon, Saskatchewan and on November 16-17, 1994 in Winnipeg, Manitoba.

The COWQ reviewed the results of the Alberta North Saskatchewan River storm event study and the Alberta Beaver River Study to identify causes of excursions to the PPWB objectives. Members also reviewed the recommendations from the Saskatchewan Cold Lake/Waterhen Task Force report. The COWQ reviewed and



approved a PPWB Water Quality Communication Plan.

The COWQ reviewed the results of the 1993/94 PPWB fish tissue samples collected from the North Saskatchewan, Saskatchewan, and Qu'Appelle Rivers. The samples met all the criteria for human consumption and were comparable to results from other regions.

The committee reviewed and approved the 1993 Excursion report to the PPWB Objectives.

The COWQ reviewed the draft PPWB Water Quality Trend reports which were distributed to all Board agencies. A brief summary of the trend results is included under the heading "Trend Assessment Study".

The COWQ in cooperation with the COG revised and approved the Interprovincial Water Quality Contingency Plan to include spills or events that have the potential to affect surface and groundwaters. The COWQ discussed and reviewed spills and unusual water quality conditions reported through the plan. Details of the spills are noted under the heading "Interprovincial Water Quality Contingency Plan".

The COWQ reviewed the results of the PPWB monitoring frequency

study for the North Saskatchewan River. The study was a joint study with Alberta Environmental Protection. The report is being prepared by Dr. Florence, Biometrics Section, Alberta Environmental Centre, Alberta Environmental Protection. The final report will be submitted to the COWQ in 1995. The committee used the results of the report to assist in revising the PPWB Water Quality Monitoring Program for 1995/96.

The PPWB Secretariat and Environment Canada prepared a background document, and a decision matrix for the COWQ for use in evaluating the PPWB Water Quality Monitoring Program for 1995/96. That program was approved by the Board at its Spring meeting. The program includes multi-media monitoring at eleven of the twelve interprovincial river reaches along the Alberta-Saskatchewan and the Saskatchewan-Manitoba boundary. This involves the collection and analysis of water and biota. The program will provide information to assist in reporting on the ecosystem health of the interprovincial river reaches.

#### **ANALYTICAL METHODS TASK FORCE**

The task force was established in 1980, by the Committee on Water

Quality, to determine comparability of water quality and analytical results from federal and provincial laboratories. This year the task force redesigned the PPWB Quality Assurance Program and continued to review data results to assess laboratory comparability. The new program now includes biological tissue samples. These samples will be used to assess laboratory comparability of mercury in fish tissues.

#### **WATER QUALITY DATA BASE**

The PPWB Secretariat has maintained a water quality data base on major interprovincial streams since 1974. Data at these locations is presented in graphical form in the report entitled "Interprovincial Water Quality Data at PPWB Monitoring Stations - April 1974 to December 31, 1991".

The Secretariat's automated statistical procedures can prepare high resolution graphic outputs for all water quality variables. A summary of the PPWB water quality data base has been installed in a GIS spreadsheet enabling the Secretariat to prepare color geographical information maps. These maps are used to help interpret water quality conditions at the interprovincial boundaries.

## MONITORING RESPONSIBILITIES

Environment Canada has conducted monthly and quarterly monitoring for the Prairie Provinces Water Board since 1974. The results of the multi-media program are used to determine if the PPWB Water Quality Objectives are being met and to determine long-term trends in water quality variables at PPWB monitoring sites. The results are also used to identify interprovincial water quality concerns and provide information required to establish baseline characteristics in water,

sediment and biota. PPWB monitoring locations are shown on the map in Appendix 3.

## WATER QUALITY CONDITIONS

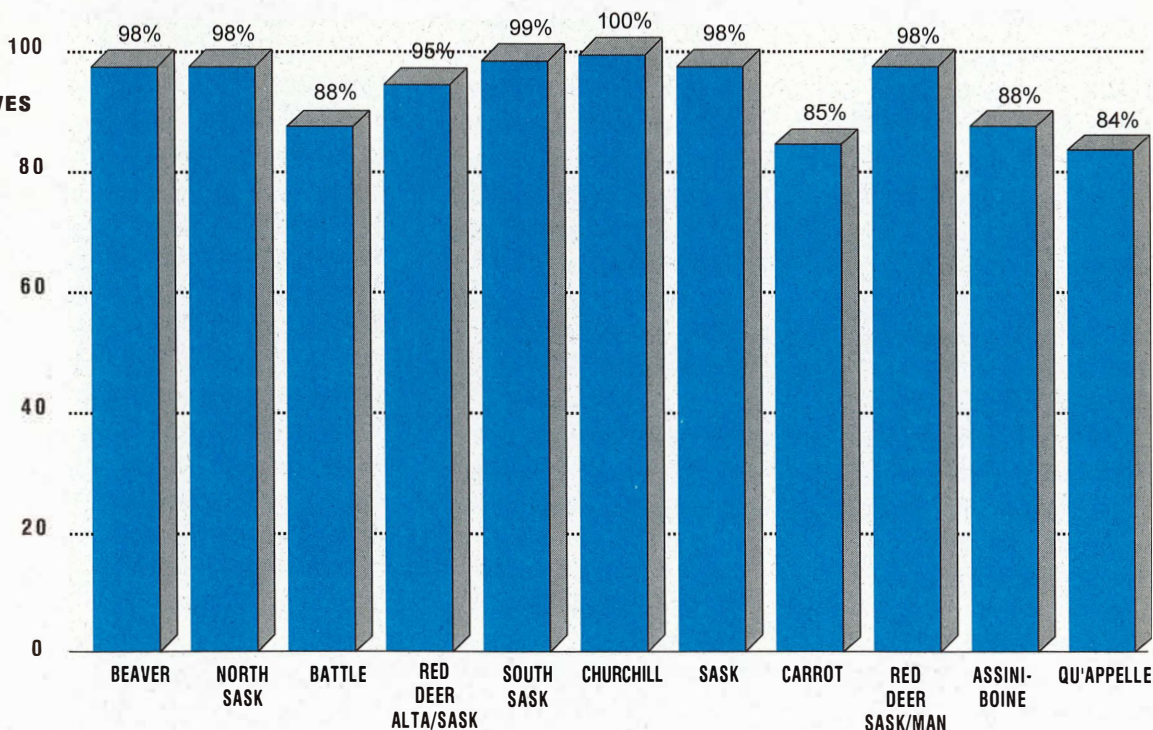
The PPWB Water Quality Agreement was signed on April 2, 1992 by the Governments of Alberta, Saskatchewan, Manitoba, and Canada. The agreement established water quality objectives at eleven interprovincial river reaches. The PPWB Water Quality Objectives are used to promote effective interprovincial water quality management, protect the users in downstream jurisdictions, evaluate the quality of

interprovincial waters and advise the Board on potential interprovincial water quality concerns.

Annually, the Committee on Water Quality continually reviews the results of the PPWB Water Quality Monitoring Program and compares the data to PPWB Water Quality Objectives.

This year's review of the water quality data collected at PPWB monitoring stations in 1994 indicates that most objectives were met in the calendar year. The percent adherence to the PPWB

## 1994 PERCENT ADHERENCE TO PPWB OBJECTIVES



site in 1994 is shown on the following page. Caution must be taken in comparing these results with previous years results, since the monitoring frequency and parameter list for some PPWB stations change periodically.

In 1994, the PPWB reach specific water quality objectives, on average, were adhered to 94% of the time. The Churchill River (100%), the South Saskatchewan River (99%), the North Saskatchewan River (98%), and the Saskatchewan River (98%) stations show the greatest adherence to the PPWB objectives. The Qu'Appelle River showed the least adherence to the objectives (84%). This was mainly due to excursions to the chloride, sodium, sulphate, total phosphorus and mercury objectives.

The dissolved oxygen objective level of 6.0 to 6.5 mg/litre was maintained at most PPWB locations during the open water period. The Assiniboine and Red Deer (S/M boundary) Rivers were the only sites which periodically displayed dissolved oxygen levels under ice conditions but objectives were not below the PPWB objective. Some sites experienced low dissolved oxygen levels under ice conditions but were not below the objective.

The PPWB objectives for barium, boron, sulphate, chromium, cobalt, nickel, vanadium, fluoride, nitrate plus nitrite, ammonia and pH were met at all sites where the objectives apply.

PPWB Major Ion objectives for chloride, sodium and sulphate were met 100% of the time at most

interprovincial river reaches. The objectives for these three constituents were exceeded on several occasions in the Qu'Appelle and Carrot Rivers. The sodium objective was exceeded in the Assiniboine River (1 time), the Battle River (11 times), the Carrot River (7 times), and the Qu'Appelle River (11 times). It is thought that these excursions are the result of groundwater input to the systems.

The total dissolved solids objective was met 100% of the time at all PPWB sites with the exception of the Battle River. The total dissolved solids objective (500 mg/litre) for the Battle River was exceeded on eleven occasions.

The PPWB objectives for zinc and lead were exceeded only once in 1994 and that occurred in the Red Deer River near Bindloss. The manganese dissolved objectives were exceeded once in the North Saskatchewan, the Saskatchewan, the Battle and the Qu'Appelle Rivers and several times in the Assiniboine, Carrot and Beaver Rivers.

The dissolved iron objectives were adhered to 100% of the time at most locations. The four exceptions where they were exceeded once or twice were in the Battle River, Carrot River, Beaver River, and the Red Deer River near Bindloss. The percent adherence to the PPWB total mercury objective in the Qu'Appelle River was 30%. The total copper objectives were adhered to 100% of the time at all sites with the exception of the Battle River, the North Saskatchewan River and the Red Deer River near Bindloss locations.

The adherence of copper total in the Battle River was 67%, in the Red Deer River was 58% and In the North Saskatchewan River was 83%. No other trace metal objectives were exceeded at PPWB sites.

Relatively high nutrient levels are typical of prairie streams. Adherence to the nitrate plus nitrite and ammonia objectives was 100% for all PPWB river reaches. The percent adherence to the PPWB total phosphorus objective (0.05 mg/litre) ranged from 100% for the Churchill River, 80% for the Saskatchewan River, 66% for the Red Deer River at Erwood, 33% for the Carrot River and as low as 0% for the Qu'Appelle and Assiniboine Rivers.

The PPWB conducts studies to investigate the cause of frequent deviations from the PPWB Water Quality Objectives. These studies are designed to determine if downstream users are at risk and what corrective action may be required to mediate any potential problems. A study was initiated in 1991/92 to look at excursions to the PPWB objectives in the Assiniboine River. The study determined that most of the excursions to the PPWB objectives are not a result of municipal discharges from Kamsack but are a result of activities upstream from the town site or natural conditions. Further study is required to identify the specific causes of these excursions on the Assiniboine River. A data review of excursions on the Saskatchewan River will be carried out by the PPWB Secretariat in 1995/96. A data review of nutrients in the Qu'Appelle River and excursions at



the PPWB site is also being proposed.

As part of the multi-media monitoring program, in 1994, fish tissue and sediment samples were collected from three to four PPWB locations. Sediment samples were collected from the North Saskatchewan, South Saskatchewan, Saskatchewan, and Red Deer (A/S boundary) Rivers. Fish tissue samples were collected from the South Saskatchewan, the North Saskatchewan, and the Saskatchewan Rivers for two species, one representing predator fish and the other representing bottom feeding fish. Ten fish samples of each species were collected from the locations and analysed. The reported fish tissue results are the average values for ten fish. Samples were collected within the PPWB river reaches.

Average mercury concentrations in walleye from the Alberta-Saskatchewan boundary sites were above the consumption guidelines of 0.5 parts per million (mg per kg). At the North Saskatchewan River site the mean mercury level in walleye was 0.64 mg/kg (n=10) and at the South Saskatchewan River site the mean level was 0.78 mg/kg (n=6). The mean level for walleye in the South Saskatchewan River was skewed upward by one large fish with a

1.47 mg/kg mercury level although all individual samples for this site still exceeded the consumption guideline. These mercury levels suggest that Walleye consumption of fish from these sites should be restricted to one meal per week. Walleye in the Saskatchewan River near The Pas contained a mean mercury concentration of 0.22 mg/kg (n=10).

The average mercury concentration in suckers from the Saskatchewan River was 0.05 mg/kg, the North Saskatchewan River 0.25 mg/kg, and from the South Saskatchewan River was 0.27 mg/kg. These levels are well below those detected in the predator fish (walleye).

Analysis for trace metals such as chromium, copper, zinc, arsenic, selenium, cadmium, nickel, lead, and molybdenum were also performed on the tissue samples from both the walleye and the suckers collected from the same three PPWB sites. Molybdenum, lead, cadmium, and arsenic levels in fish tissue were at or below the detection limit at all sites. Detectable levels of chromium and nickel were found in walleye collected from the Saskatchewan and South Saskatchewan Rivers. Copper levels in all fish were generally below detection, except in suckers collected from the North

Saskatchewan River. Zinc and selenium were present in all samples, but not at levels expected to affect fish populations or consumptive use.

Analytical results for suspended sediment at selected PPWB locations for 1994 are not yet available for interpretation. These results will be interpreted by the PPWB Committee on Water Quality.

#### **INTERPROVINCIAL WATER QUALITY CONTINGENCY PLAN**

The PPWB Interprovincial Water Quality Contingency Plan continues to be an effective method of informing Board agencies of spills or unusual water quality conditions in interprovincial streams. The plan was updated this fiscal year to also include spills or unusual water quality conditions which have the potential to affect groundwater. One spill was reported to member agencies during the year.

The spill occurred between September 1 and September 7, 1994 when 3 million gallons of raw sewage were accidentally released to the South Saskatchewan River at Saskatoon. The spill was caused by a blocked sewage line in the city. City crews chlorinated the sewage outfall and samples were taken to verify disinfection. It was

anticipated that the spill would not have an effect on the water quality of the Saskatchewan River at the Saskatchewan-Manitoba boundary.

## **STUDIES**

### **Trend Assessment Study**

Determining water quality trends at the interprovincial boundaries are an essential component of the PPWB monitoring program. The results of the trend studies assist in identifying, at an early stage, potential interprovincial water quality concerns.

The Secretariat has now completed draft water quality trend reports for all eleven interprovincial water quality monitoring locations.

A series of 16 non-parametric trend analysis tests were performed along with time series plots and best fit lines to determine trends in water quality at the PPWB sites. The reports summarize the trend results and excursions to the PPWB objectives.

In general, water quality conditions at PPWB sites improved in the last fifteen to twenty years with more variables decreasing in concentration than those that increased. For instance, in the Saskatchewan River, nine variables decreased in concentrations for the period 1974

to 1992 while only one variable increased slightly in concentration.

The results indicate that alpha BHC has decreased in concentration at all PPWB sites. This trend is probably a result of the recent limited use of alpha BHC in the provinces. Nitrogen levels have also decreased at all sites in the region. This may be a result of improved municipal treatment facilities on prairie streams.

In general some metals decreased at most sites but are still a potential concern for aquatic life or municipal water use in Red Deer River at the Alberta-Saskatchewan boundary (iron and copper), the Beaver River (manganese and iron), the Battle River (manganese, iron, copper, and zinc), and the North Saskatchewan River (Manganese and copper). Manganese also has the potential to be a concern with municipal water users on the Assiniboine and Qu'Appelle Rivers. These metals could be a concern because they are still at levels which periodically exceed the PPWB objectives.

### **Monitoring Frequency Study**

In 1993 a Monitoring Frequency Study was initiated by the Prairie Provinces Water Board and Alberta Environmental Protection to determine optimum monitoring

frequencies for water quality variables in the North Saskatchewan River. The draft report was reviewed by the Committee on Water Quality at the November 16-17, 1994 meeting. A final report is expected early in 1995.

### **Geographical Information System Mapping Activities**

The PPWB Secretariat maintains a GIS system (Spans Map). The program is capable of creating color maps that can display water quality variables in graphical form which are tied to longitude and latitude locations on the prairie maps. Water Quality summary data for all PPWB locations can now be displayed simultaneously on a map of the prairie provinces. Plans are to import land use and eventually point source discharge information into the GIS system. This will assist in the interpretation of water quality data and potential sources of excursions to the PPWB objectives. Summarized sediment data at the interprovincial boundaries is also being included in the GIS software.

## **SECRETARIAT ACTIVITIES**

In addition to the activities previously described for 1994/95 the Secretariat:

- updated the PPWB Water Quality Monitoring Program for 1995/96;
- verified water quality data results for all PPWB monitoring sites and updated data files for water, sediment and fish on the in-house computer;
- participated in a workshop for the Partners for the Saskatchewan River Basin;
- presented a paper on PPWB water quality trends at the boundaries at the CWRA conference in Winnipeg;
- reviewing the draft CCME Environmental Management Framework Agreement;
- participated in an Environment Canada Pesticide Monitoring Workshop; and
- met with the Assiniboine River Management Advisory Board.



## PPWB WATER QUALITY MONITORING 1994 PARAMETER LIST

### Water (Monthly collection at all sites)

Alkalinity, phenol.  
 Alkalinity, total  
 Aluminum, diss.  
 Aluminum, total  
 Boron, diss.  
 Barium, total  
 Bicarbonate, calc.  
 Cadmium, total  
 Calcium, diss.  
 Carbon, diss., organic  
 Carbon, organic, particulate  
 Carbonate, calc.  
 Chloride, diss.  
 Chlorophenolics  
 Chromium, total  
 Cobalt, total  
 ▲ Coliforms, fecal  
 ▲ Coliforms, total  
 Color, true  
 Copper, total  
 Fluoride, diss.  
 Free CO<sub>2</sub>  
 Hardness, non-carbonate  
 Hardness, total CaCO<sub>3</sub>  
 Iron, diss.  
 Lead, total

Manganese, diss.  
 Magnesium, diss.  
 Mercury, total  
 Nickel, total  
 Nitrogen, diss., NO<sub>3</sub>+NO<sub>2</sub>  
 Nitrogen, particulate  
 Nitrogen, total Ammonia  
 Nitrogen, total, calc.  
 Nitrogen, total, diss.  
 Oxygen, diss., DO  
 pH  
 Phosphorus Ortho as P  
 Phosphorus, part. calc.  
 Phosphorus, total diss.  
 Phosphorus, total as P  
 Potassium, diss.  
 Residue, fixed, non-filterable  
 Residue, non-filterable  
 Silica, reactive  
 Sodium, percent  
 Sodium, diss.  
 Solids, total diss., calc.  
 Specific Conductance  
 Sulphate, diss.  
 Temperature  
 Turbidity  
 Vanadium, total  
 Zinc, total

### Sediments (Fall collection at 4 sites ■)

Arsenic & Selenium  
 Bioavailable Phosphorus  
 Chlorophenolics  
 Neutral Herbs and OC/PCB's  
 Particle Size  
 Polyaromatic Hydrocarbons  
 Mercury total  
 Total Metals

### Fish (Fall collection at 3 sites \*)

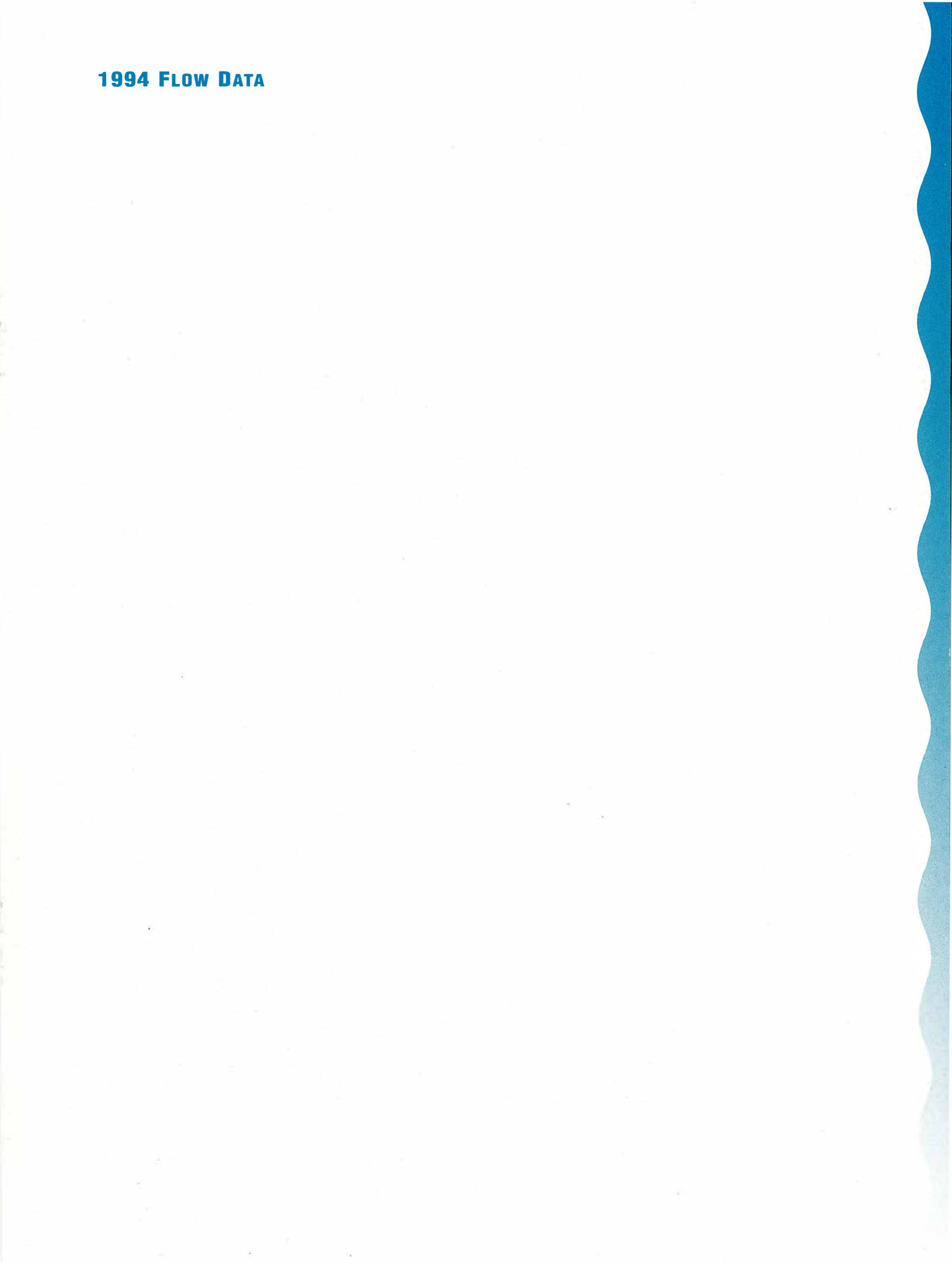
Arsenic & Selenium  
 Chlorophenolics  
 Lipids  
 OC's/PCB's  
 Mercury total  
 Total Metals  
 Molybdenum, total

▲ Collected 4 to 12 times a year

■ Collected from N. Sask., S. Sask., Sask., and Red Deer (A/S) Rivers

\* Collected from S. Sask., N. Sask. and Sask. Rivers

## 1994 FLOW DATA



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**RECORDED AND NATURAL FLOWS, CONSUMPTIVE USE, DIVERSION, AND STORAGE  
(in Cubic Decametres) FOR THE 1994 APPORTIONMENT PERIOD**

**SOUTH SASKATCHEWAN RIVER - ALBERTA-SASKATCHEWAN BOUNDARY**

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED DISCHARGE	207 270	234 500	512 170	350 910	770 240	906 320	290 770	177 470	152 340	164 750	158 580	181 470	4 106 790
COMSUMPTIVE USE	-160	-180	-160	102 900	202 300	237 720	462 430	354 950	241 300	105 310	-1 730	-1 910	1 702 770
CHANGE IN RESERVOIR STORAGE	-86 760	-97 970	-61 740	-20 450	149 340	200 210	-6 040	-128 820	-128 490	-43 480	-37 400	-69 460	-331 060
DIVERSION FROM BASIN	0	0	0	2 610	18 630	22 040	27 670	29 330	19 080	17 310	0	0	136 670
NATURAL FLOW ALTA. - SASK. BOUNDARY	129 200	136 870	442 000	389 790	1 129 360	1 324 130	778 210	471 060	302 440	256 720	148 290	108 800	5 616 870

**RED DEER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY**

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED DISCHARGE	50 319	45 801	245 756	207 602	149 144	232 183	172 748	146 163	144 115	94 954	45 241	35 206	1 569 232
COMSUMPTIVE USE	0	0	0	240	3 700	1 270	3 460	2 940	980	-200	0	0	12 390
CHANGE IN RESERVOIR STORAGE	-25 370	-23 970	6 130	-19 190	14 900	29 420	8 100	19 490	12 840	-620	-18 350	-22 860	-19 480
DIVERSION INTO BASIN	0	0	0	-2 610	-18 630	-22 040	-27 670	-29 330	-19 080	-17 310	0	0	-136 670
NATURAL FLOW ALTA. - SASK. BOUNDARY	22 779	23 481	247 296	188 292	138 054	245 653	159 668	136 493	140 375	78 494	32 091	9 316	1 421 992

**SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER**

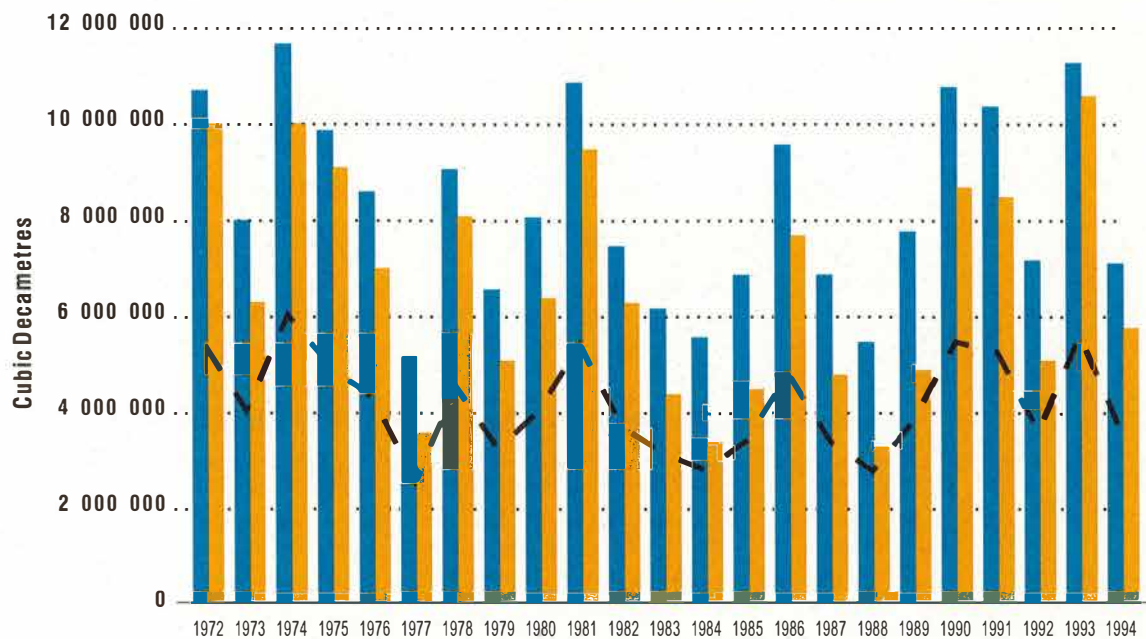
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	258 000	280 000	758 000	559 000	919 000	1 139 000	464 000	324 000	296 000	260 000	204 000	217 000	5 678 000
NATURAL FLOW	152 000	160 000	689 000	578 000	1 267 000	1 570 000	938 000	608 000	443 000	335 000	180 000	118 000	7 038 000

Natural flows for the South Saskatchewan and Red Deer Rivers have been calculated using preliminary data and the methodology described in a report entitled "South Saskatchewan River Below Red Deer River — Natural Flow", April 1985 (PPWB Report No. 45).



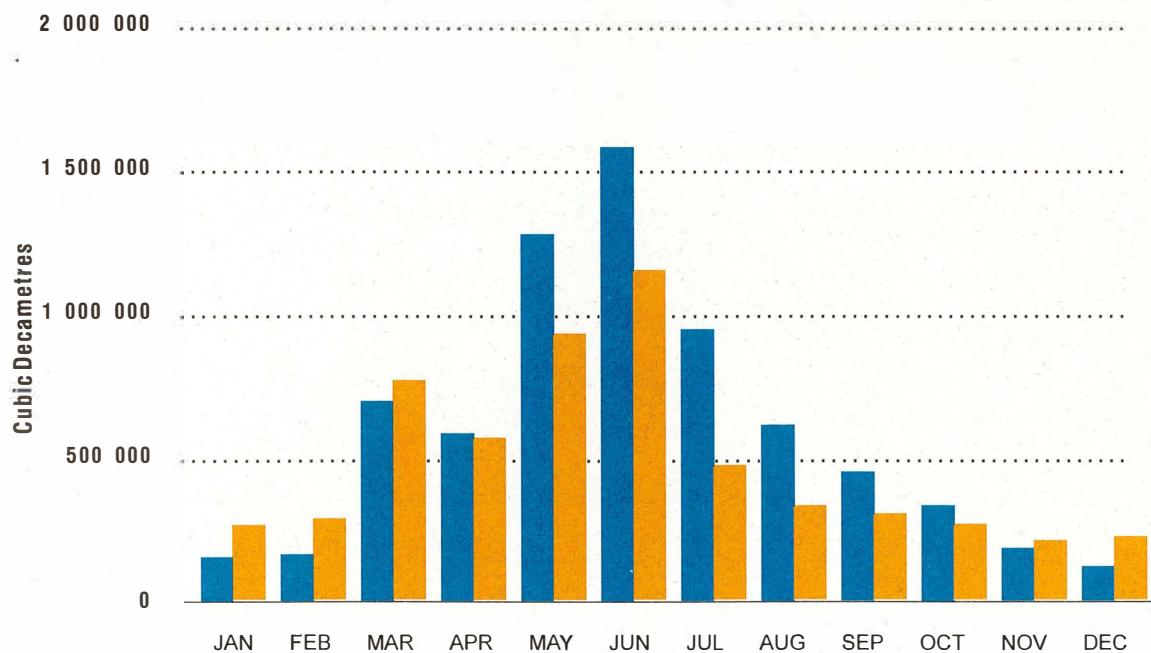
**ANNUAL FLOWS OF  
THE SOUTH  
SASKATCHEWAN  
RIVER NEAR  
ALBERTA —  
SASKATCHEWAN  
BOUNDARY  
(INCLUDES RED  
DEER RIVER)**

■ NATURAL  
— 50% NAT.  
■ RECORDED



**1994 MONTHLY  
FLOWS OF THE  
SOUTH  
SASKATCHEWAN  
RIVER NEAR  
ALBERTA —  
SASKATCHEWAN  
BOUNDARY  
(INCLUDES RED  
DEER RIVER)**

■ NATURAL  
■ RECORDED



**RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THE SASKATCHEWAN-MANITOBA BOUNDARY (in Cubic Decametres) FOR THE 1994 APPORTIONMENT PERIOD**

APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN. FEB. MAR. TOTALS

**CHURCHILL RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (AT SANDY BAY)**

RECORDED FLOW	1 070 000	1 230 000	1 380 000	1 540 000	1 350 000	1 200 000	1 370 000	1 460 000	1 570 000	1 560 000	1 400 000	1 580 000	16 710 000
NATURAL FLOW	1 110 000	1 580 000	2 280 000	2 670 000	2 380 000	1 860 000	1 540 000	1 330 000	1 250 000	1 160 000	1 020 000	1 080 000	19 260 000

**SASKATCHEWAN RIVER - SASKATCHEWAN-MANITOBA BOUNDARY**

ESTIMATED FLOW	1 990 000	2 020 000	1 390 000	1 600 000	1 340 000	1 030 000	884 000	697 000	704 000	777 000	868 000	860 000	14 160 000
APPORTIONMENT FLOW	2 310 000	2 250 000	2 220 000	1 990 000	1 430 000	1 070 000	947 000	358 000	428 000	310 000	434 000	608 000	14 355 000

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

RECORDED FLOW	78 900	95 800	57 100	44 700	17 600	19 300	22 800	25 600	17 500	13 100	9 910	28 500	430 810
NATURAL FLOW	77 144	46 207	44 547	52 594	39 099	28 280	15 626	8 801	2 563	53	0	34 761	349 675

**CARROT RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR TURNBERRY)**

RECORDED FLOW	89 400	86 000	57 800	43 400	20 600	6 100	5 070	5 570	4 170	3 590	3 010	4 810	330 000
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**RED DEER RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR ERWOOD)**

RECORDED FLOW	97 900	55 400	56 800	59 400	10 100	5 640	5 860	5 430	3 620	5 220	3 240	5 520	314 000
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**ASSINIBOINE RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (AT KAMSACK)**

RECORDED FLOW	42 800	17 800	19 500	30 500	3 020	1 560	2 030	2 140	2 140	1 640	1 510	4 500	129 000
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**RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THE  
ALBERTA-SASKATCHEWAN BOUNDARY (in Cubic Decametres) FOR THE 1994 APPORTIONMENT PERIOD**

JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. TOTALS

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

RECORDED FLOW	311 000	313 000	384 000	992 000	575 000	889 000	706 000	475 000	395 000	336 000	267 000	316 000	5 959 000
NATURAL FLOW	36 100	87 600	170 000	784 000	637 000	1 170 000	1 170 000	907 000	532 000	348 000	69 100	16 200	5 927 000

**BATTLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	-	302	1 804	2 139	1 462	1 220	715	508	597	653	-	-	9 400
NATURAL FLOW	-	302	1 804	2 232	1 482	1 303	739	543	611	653	-	-	9 669

**LODGE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	-	76	10 123	7 969	1 045	515	194	0	1	1	-	-	19 924
NATURAL FLOW	-	83	10 905	7 932	1 093	686	176	0	0	0	-	-	20 875

**MIDDLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	-	4	3 512	4 417	301	158	77	57	41	32	-	-	8 599
NATURAL FLOW	-	7	4 028	4 286	261	152	30	4	39	30	-	-	8 837

**BEAVER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY (AT COLD LAKE RESERVE)**

RECORDED FLOW	9 030	6 540	6 520	86 500	42 800	93 300	105 000	26 200	6 680	7 060	4 690	4 150	398 000
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**BATTLE RIVER - ALBERTA-SASKATCHEWAN BOUNDARY**

RECORDED FLOW	2 010	1 870	26 300	47 500	19 600	22 300	10 600	4 210	2 350	4 590	3 300	1 990	147 000
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## **APPENDIX I**

### **STATEMENT OF EXPENDITURES AND FINAL CLAIM**

# **PRAIRIE PROVINCES WATER BOARD STATEMENT OF EXPENDITURES AND FINAL CLAIM**

**FINANCIAL YEAR  
1994/95**

For expenditures in accordance with the Prairie Provinces Water Board Agreement dated October 30, 1969 (see Section 10, Schedule C and Section 15 of the By-Laws).

ITEMS	BUDGET FOR 94/95	EXPENDITURES
Salaries:		
(01) Permanent Staff	\$ 251 700	\$ 257 853
(02) Temporary Staff	0	0
(03) Overtime/Other Pay	1 300	1 289
TOTAL SALARIES	<u>\$ 270 700</u>	<u>\$ 259 142</u>
O & M:		
(07) Travel	\$ 16 300	\$ 13 034
(09) Postage	1 200	718
(10) Telecommunications	5 300	3 661
(15) Printing	17 000	20 150
(18) Profess. Services	8 000	9 000
(19) Training	1 000	210
(20) Temporary Help	1 100	266
(21) Personal Services	34 100	27 569
(22) Other Services	700	2 403
(25) Rentals	38 100	34 892
(28) Equipment Repair	1 000	89
(33) Purchased Materials	3 800	4 603
(35) Parts & Consumables	2 500	1 523
(41) Equipment Acquisition	4 900	8 029
TOTAL O & M	<u>\$ 135 000</u>	<u>\$ 126 147</u>
TOTAL SALARIES AND O & M	\$ 388 000	\$ 385 289
FRINGE BENEFITS *	\$ 22 653	\$ 23 207
TOTAL EXPENDITURES	<u>\$ 410 653</u>	<u>\$ 408 496</u>

**253,000**

*\* Nine percent of Permanent Salaries*

Each province's share (one-sixth of the total amount of \$408 496) is \$68 083.

**FINAL CLAIM**

**\$ 68 083**

**PRAIRIE PROVINCES WATER BOARD  
STATEMENT OF EXPENDITURES AND  
FINAL CLAIM**

1995

**FINANCIAL YEAR  
1995/96**

For expenditures in accordance with the Prairie Provinces Water Board Agreement dated October 30, 1969  
(see Section 10, Schedule C and Section 15 of the By-Laws).

<b>ITEMS</b>	<b>BUDGET FOR 95/96</b>	<b>EXPENDITURES</b>
Salaries:		
(01) Permanent Staff	\$ 267 200	\$ 179 769
(02) Temporary Staff	0	0
(03) Overtime/Other Pay	1 300	0
<b>TOTAL SALARIES</b>	<u>\$ 268 500</u>	<u>\$ 179 769 (1)</u>
O & M:		
(07) Travel	\$ 15 200	\$ 10 972
(09) Postage	1 200	611
(10) Telecommunications	5 000	3 474
(15) Printing	4 600	6 269
(18) Profess. Services	0	0
(19) Training	0	0
(20) Temporary Help	500	0
(21) Personal Services	0	0
(22) Other Services	1 650	526
(25) Rentals	38 100	33 185
(28) Equipment Repair	500	527
(33) Purchased Materials	3 500	4 300
(35) Parts & Consumables	1 750	1 620
(41) Equipment Acquisition	0	3 797
<b>TOTAL O &amp; M</b>	<u>\$ 72 000</u>	<u>\$ 65 281</u>
<b>TOTAL SALARIES AND O &amp; M</b>	<b>\$ 340 500</b>	<b>\$ 245 050</b>
<b>FRINGE BENEFITS (2)</b>	<u>\$ 24 048</u>	<u>\$ 16 179</u>
<b>TOTAL EXPENDITURES</b>	<u>\$ 364 548</u>	<u>\$ 261 229</u>
Less Revenue from Books Sales		-464
		<u>\$ 260 765</u>

(1) Includes Pay Equity

(2) 9% of Permanent Salaries

Each Province's share (one-sixth of the total amount of \$260 765) is \$43 461.

**FINAL CLAIM**

**\$ 43 461**

## **APPENDIX II**

### **BOARD/COMMITTEE MEMBERSHIP**



## PPWB MEMBERS

<b>CHAIRMAN</b>	J. Vollmershausen	Regional Director General Prairie and Northern Region Environment Canada
	H.M. Hill	Director General Prairie Farm Rehabilitation Administration Agriculture Canada
	J.W. Thiessen	Assistant Deputy Minister Natural Resources Services Alberta Environmental Protection
	W.L. Dybvig	Vice President Water Management Division Saskatchewan Water Corporation
	L.J. Whitney	Water Resources Branch Manitoba Natural Resources
.....		
<b>SECRETARY</b>	G.W. Dunn	Water Quality Specialist Prairie Provinces Water Board

## PPWB ALTERNATE MEMBERS

G. McKeating	Director Prairie and Northern Region Environmental Conservation Branch Environment Canada
A.F. Lukey	Director Engineering and Sustainability Service Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada
P. Valentine	Director Technical Services and Monitoring Division Alberta Environmental Protection
B.G. Collins	Manager, Integrated Resources Water Management Division Saskatchewan Water Corporation
Vacant	Manitoba Natural Resources

## COMMITTEE ON HYDROLOGY

### TERMS OF REFERENCE

At the request of, and under the direction of the PPWB, the Committee on Hydrology 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.

Approved: October 17, 1972  
PPWB Minute 7-11

### MEMBERS

#### CHAIRMAN

R.L. Kellow	Executive Director Prairie Provinces Water Board
R.G. Boals	Monitoring Operations Division Environment Canada
F.R.J. Martin	Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada
R.A. Bothe	Surface Water Assessment Branch Alberta Environmental Protection
R.J. Bowering	Water Resources Branch Manitoba Natural Resources
A.B. Banga	Water Management Division Saskatchewan Water Corporation
R.F. Hopkinson	Atmospheric and Hydrologic Science Division Environment Canada

#### SECRETARY

A.J. Chen	Operations Engineer Prairie Provinces Water Board
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## TERMS OF REFERENCE

Under the direction of the Prairie Provinces Water Board, the Committee on Water Quality shall investigate, oversee, review, report, recommend and advise the Board on matters pertaining to the water quality 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, 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 recommend remedial or preventative measures for avoiding and resolving water quality issues.

The Committee shall foster an awareness and an 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 Committee shall also assist the Committee on Groundwater in the development of interprovincial groundwater programs by identifying water quality monitoring needs for interprovincial groundwater aquifers.

## MEMBERS

### CHAIRMAN

R.L. Kellow	Executive Director Prairie Provinces Water Board
W.D. Gummer	Ecosystem Quality Division Environment Canada
M. Morelli	Environmental Quality Standards Branch Manitoba Environment
R.G. Ruggles	Municipal Branch Saskatchewan Environment and Resource Management
D.O. Trew	Water Quality Section Surface Water Assessment Branch Alberta Environmental Protection
E.W. Allison (May/84-Nov/94)	Land Ecology Division Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada

### SECRETARY

G.W. Dunn	Water Quality Specialist Prairie Provinces Water Board
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## COMMITTEE ON GROUNDWATER

### TERMS OF REFERENCE

Recognizing the interrelationship 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.

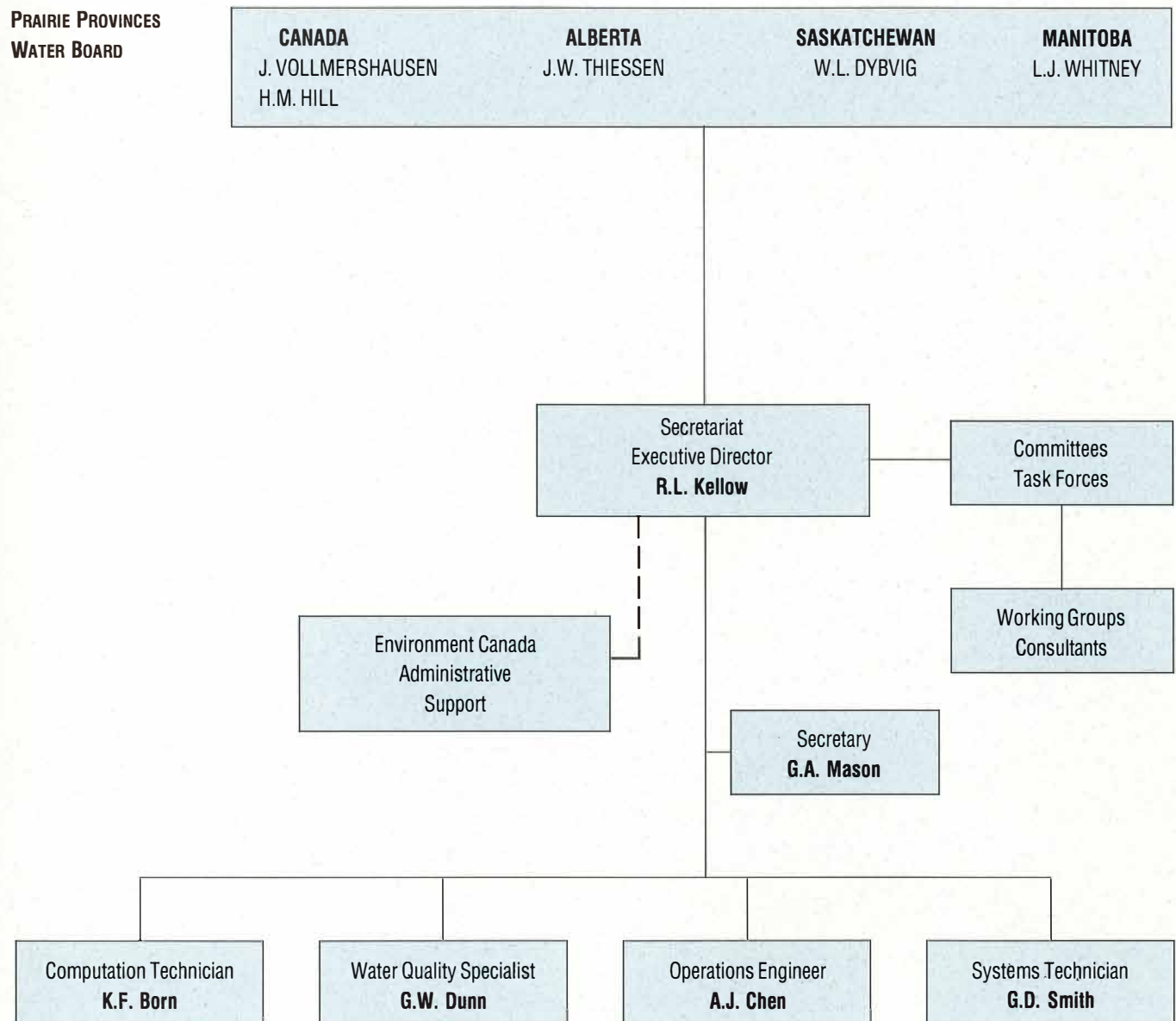
Responsibilities of the Committee will include: exchange of information; compilation and interpretation of existing data; recommendations on groundwater information and monitoring requirements; determination of implications of proposed projects which may impact the quantity and/or quality of waters at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

Approved: November 18-19, 1981  
PPWB Minute 26-25

### MEMBERS

<b>CHAIRMAN</b>	R.L. Kellow	Executive Director Prairie Provinces Water Board
	G.D. Grove	Environmental Sciences Division National Hydrology Research Institute Environment Canada
	J. Lebedin	Earth Sciences Division Prairie Farm Rehabilitation Administration Agriculture and Agri-Food Canada
	R.C. Hardick	Hydrogeology Branch Technical Services and Monitoring Division Alberta Environmental Protection
	N. Shaheen	Water Management Division Saskatchewan Water Corporation
	L. Gray	Hydrotechnical Services Manitoba Natural Resources
.....		
<b>SECRETARY</b>	A.J. Chen	Operations Engineer Prairie Provinces Water Board

# ORGANIZATIONAL CHART



## **APPENDIX III**

### **PPWB MONITORING LOCATIONS MAP**



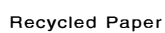
# **PPWB MONITORING LOCATIONS MAP**



- PPWB Water Quantity and Quality Monitoring Locations
- 1. Cold River
- 2. Beaver River
- 3. North Saskatchewan River
- 4. Battle River
- 5. Red Deer River (Alta./Sask.)
- 6. South Sask. River
- 7. Churchill River
- 8. Saskatchewan River
- 9. Carrot River
- 10. Red Deer River (Sask./Man.)
- 11. Assiniboine River
- 12. Qu'Appelle River
- Hydrometric Sites used for apportionment monitoring



## This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.



## NOTES

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## This image shows a full page of white paper with horizontal dotted lines, typical of notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

