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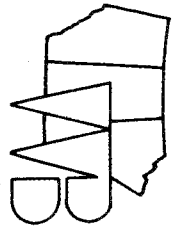
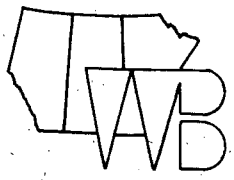


PRAIRIE PROVINCES WATER BOARD



PRAIRIE PROVINCES WATER BOARD

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ANNUAL REPORT

FOR THE YEAR ENDING MARCH 31, 1993

ISSN 0704-8726

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LETTER OF TRANSMITTAL

September 11, 1993

Honourable Pierre H. Vincent
Minister of the Environment
Ottawa, Canada

Honourable Brian Evans
Minister of Environment
Edmonton, Alberta

Honourable Charles Mayer
Minister of Agriculture and Agri-Food
Ottawa, Ontario

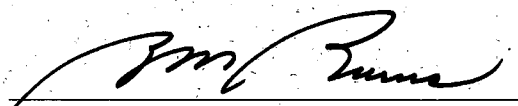
Honourable Berny Wiens
Minister Responsible for
Saskatchewan Water Corporation
Regina, Saskatchewan

Honourable Harry J. Enns
Minister of Natural Resources
Winnipeg, Manitoba

Gentlemen:

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, 1993.

Yours truly,



B.M. Burns, Chairman

MESSAGE FROM THE EXECUTIVE DIRECTOR

In last year's Annual Report I noted, in response to interprovincial water quality concerns, that the Prairie Provinces Water Board was developing a new agreement. I am pleased to report that on April 2, 1992 the PPWB Water Quality Agreement was signed.

This agreement establishes water quality objectives at 11 interprovincial river reaches and defines the PPWB water quality mandate and duties of the Board. The agreement also commits each of the parties to take all reasonable and practical measures to maintain or improve existing water quality.

The PPWB Water Quality Monitoring Program was modified in 1992/93 to include sediments and biota. The results of the 1992/93 monitoring program showed the water quality was good during the year, with an average of 96 percent adherence to the objectives.

To detect small changes in water quality at an early stage, the PPWB began conducting trend analysis with procedures developed for the PPWB by the National Water Research Institute. The results of the first study, the North Saskatchewan and Qu'Appelle Rivers, will be available in 1993/94.

The PPWB, in its continuing effort to meet its mandate as cost- effectively as possible, initiated a joint study with Alberta Environmental Protection to determine the most appropriate monitoring frequency for PPWB water quality monitoring sites. Study results will be available next fiscal year. A report was also completed summarizing water quality data collected at PPWB monitoring sites from 1974 to 1991.

Water apportionment conditions were met on all streams in 1992/93 except for a minor deficit of 59 dam^3 on Lodge Creek. A natural flow study being done on Lodge and Middle Creeks will be useful in identifying procedures to avoid future deficits. On the South Saskatchewan River, Alberta delivered 72 percent of the total annual natural flow and met the minimum flow criteria at all times.

During the year the Committee on Hydrology completed a strategy report on apportionment monitoring of 20 small interprovincial streams. In response to low water levels on Cold Lake the Board directed that apportionment procedures be developed for the Cold Lake basin. Recommendations will be presented to the Board in 1993/94.

Applying a methodology developed by the National Hydrology Research Institute for the PPWB, work began in preparing groundwater vulnerability maps along the interprovincial boundaries. The maps will provide information on groundwater pollution vulnerability from surface activities. The Board also approved an implementation plan for Committee on Groundwater activities to facilitate the sustainability of interprovincial aquifers.

While there were a number of accomplishments during the year, the signing of the Water Quality Agreement stands out. This agreement reaffirms the PPWB ability to respond to new challenges and the ability to work cooperatively for the sustainability of our vital shared water resources. Efforts such as this make the PPWB a model of interjurisdictional water management.

R L Kellow

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, 1992, to March 31, 1993.

The Board met twice during 1992/93; April 8, 1993, in Regina, Saskatchewan and October 20, 1993, in Winnipeg, Manitoba.

A total of seven committee meetings were held throughout the year: the Committee on Hydrology (COH) met three times, the Committee on Water Quality (COWQ) met twice including a conference call, and the Committee on Groundwater (COG) met twice.

HISTORY

The Prairie Provinces Water Board was formed on July 28, 1948. 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 Provinces of Manitoba, Saskatchewan and Alberta 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.

SECRETARIAT OPERATION

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

In 1992/93, the Secretariat hired a computations technician under contract to do natural flow computations, water demand study updating and preparation of water quality and quantity graphs and tables for reports required by the Board.

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, the Water Resources Branch of Environment Canada monitors streamflow at several hydrometric sites. Data gathered are used to determine natural stream flows for apportionment purposes.

During 1992/93 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, 1993, 114 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 17 Atmospheric Environment Service (AES), Environment Canada, meteorological monitoring stations in the three prairie provinces. These sites provide information for computing natural flow at the interprovincial boundaries.

At its spring 1993 meeting, the Board approved the 1993/94 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 5 016 000 cubic decametres (dam^3) in the South Saskatchewan River, at the point below its junction with the Red Deer River, represented 72 percent of the total annual natural flow of 6 977 000 dam^3. A summary of recorded and natural flow volumes for 1992 at this apportionment point is shown in table and graph form on pages 18 and 19.[1]

From January 1 to December 31, 1992 daily recorded discharges of the South Saskatchewan River at the apportionment point were 42.5 m^3/s (1500 ft^3/s) or more. These flows fulfilled the terms of the 1969 Master Agreement on Apportionment.

The natural flow of the Qu'Appelle River at the Saskatchewan-Manitoba boundary between April 1, 1992 and March 31, 1993, was 89 851 dam^3. Recorded flow augmented by releases of 122 780 dam^3 from Lake Diefenbaker, was 149 010 dam^3. Recorded and natural flows covering April 1, 1992 to March 31, 1993 are shown on page 20.

Environment Canada, Water Resources Branch, Regina, continued to report the apportionment balance for Lodge and Middle Creeks on a monthly basis during the open water period. Prior to 1990 the reporting period had been three times a year. The increase in monitoring was recommended in 1990 by the COH because of drought conditions in the basin. Apportionment balance, as calculated by the Water Resources Branch, indicated more than 75 percent of Battle, and Middle Creeks' natural flow at the interprovincial boundary was passed to Saskatchewan. On Lodge Creek only 62% of the natural flow passed to Saskatchewan, resulting in an apportionment deficit of 59 dam^3. Recorded and natural

[1]The apportionment 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.

flow data for these three creeks are shown on page 21.

Natural flows in the South Saskatchewan River basin were calculated using the project depletion method, while natural flows for the Qu'Appelle River basin were determined according to the "Streamflow Synthesis and Reservoir Regulation" (SSARR) 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 20 and 21.

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, 1992 to March 31, 1993 the recorded flow for the Pipestone at the boundary was 13 217 dam^3, compared to a natural flow of 15 097 dam^3 — an excess flow of 5669 dam^3.

COMMITTEE ON HYDROLOGY

The Committee on Hydrology met three times during the year on April 3-4, 1992 in Winnipeg, Manitoba, on September 10, 1992 in Regina, Saskatchewan, and on March 8-9, 1993 in Calgary, Alberta.

During these meetings, the Committee discussed the low water level of Cold Lake. They agreed that the low water level was primarily due to drought conditions in the basin. At the request of the Board, the apportionment balance for 1991 and 1992 was determined. The results showed that Saskatchewan received its fair share of the natural flow from Cold Lake in each of these years.

In response to a Board assignment to prepare a report on how to apportion the water of interprovincial lakes, the Committee agreed that the report should focus on the Cold Lake basin including the Martineau River, Primrose Lake and Cold Lake. Draft reports were reviewed in December 1992 and at the March 1993 COH meeting. The report will be finalized in 1993/94.

The Committee approved a report, prepared by Sask Water, entitled "Pipestone Creek Natural Flow at the Saskatchewan-Manitoba Boundary". A copy of the final report was distributed to Committee Members in January 1993. Sask Water will be converting the Pipestone Creek natural flow model to a microcomputer version which the Secretariat will use to compute natural flows of Pipestone Creek at the interprovincial boundary.

The Committee, at its March 1993 meeting, approved a report entitled "Strategies for Apportionment Monitoring of Small Interprovincial Streams". The report includes a categorization of streams for potential apportionment problems, a cost-effective strategy for improving the existing data base and a procedure for keeping the Committee informed of potential apportionment problems and for notifying the Board when monitoring is required. The report will be sent to the Board in 1993/94.

The Committee agreed that the computation period for interprovincial apportionment of Lodge, Middle and Battle Creeks, be changed from 10 days to 15 days to correspond to the changes made for international apportionment.

In response to a request made by Environment Canada to reduce the Qu'Appelle River monitoring network by six station units, the Committee agreed that the four index reservoir stations in the network could be discontinued. Any further reductions in the Qu'Appelle River network should wait until an evaluation of the monitoring network is completed.

The Committee reviewed a proposal, prepared by the Canada Water Resources Branch, Calgary, on the use of historical records of return flows for high, average and low flow years to estimate return flow volumes needed for the South Saskatchewan River natural flow calculation. The Committee noted that such an approach may produce misleading results, and that reduction of return flow stations in Southern Alberta would affect both water quantity and quality monitoring.

The Committee reviewed a first draft of report entitled "Lodge and Middle Creek Basins Historical Monthly Natural Flows 1911 to 1991", prepared by the Hydrology Branch of Alberta Environmental Protection. Several comments were suggested particularly on the proposed channel loss equations. Alberta Environmental Protection in cooperation with Environment Canada will in 1993/94 undertake a channel loss study in the Middle Creek basin. The results of that study will be used to obtain a new set of channel loss equations.

STUDIES

Lodge and Middle Creeks Natural Flow Study

As suggested by the Committee on Hydrology, the Hydrology 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 the report will be finalized in 1994/95. The results of the study will be used by the COH in determining steps to minimize apportionment problems in these basins.

Strategies for Apportionment Monitoring of Small Interprovincial Streams

The Board, at its October 1987 meeting, instructed the COH to develop a strategy paper on apportionment monitoring for small interprovincial streams. The report includes a categorization of 20 streams for potential apportionment problems, a cost-effective strategy for improving the existing data base, and a procedure for keeping the Committee informed of potential apportionment problems. The report was approved by the COH at its March 1993 meeting, and will be forwarded to the Board in 1993/94.

Apportionment of Interprovincial Lakes

In response to a concern raised in 1991 regarding low water levels on Cold Lake, the Board at its spring 1992 meeting, directed the COH to review the apportionment agreement and make recommendations on its applicability to interprovincial lakes. The COH concluded that given the variation in hydrological characteristics, geographic configurations, jurisdictional interests, and existing water uses, it would be

difficult to develop a generalized apportionment method suitable for all lakes. Given the recent problems on Cold Lake, the COH decided to focus on how the Cold Lake basin should be apportioned. Draft reports were reviewed in December 1992 and at the March 1993 COH meeting. It is anticipated that the report will be finalized in 1993/94.

Natural Flow Studies on Small Interprovincial Basins

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.

Pipestone Creek Report

In response to a concern raised by a task force reviewing operational procedures of Moosomin Dam and apportionment problems of Pipestone Creek flows, the Committee on Hydrology suggested conducting a study to provide a more precise estimate of historical natural flows on Pipestone Creek.

In April, 1989, the Prairie Provinces Water Board contracted the Saskatchewan Water Corporation to undertake a natural flow study of Pipestone Creek. The report was completed and approved by the COH in September, 1992.

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 accurate estimate of total consumption in the Boxelder Creek basin. This data is reported to the Board.

The total irrigation and municipal water use in the Alberta portion of the basin for 1992 was 26 dam^3. During the same period, the four provincial reservoirs stored 1086 dam^3

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

and released 709 dam^3 to the Boxelder Creek system. Based on the responses of the 1992 water use survey, conducted by Sask Water, no water was 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 1992 Saskatchewan licensed three new drainage projects with potential interprovincial implications. Manitoba and Alberta both reported no projects with the potential to affect streams crossing interprovincial boundaries.

WATER USE

In 1982 the PPWB prepared 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.

In 1990 the PPWB completed an update of the data base to 1986. This update provides information on population trends, as well as water use data for municipal, industrial, power and agricultural purposes.

The date base will be updated to 1991 next fiscal year.

SECRETARIAT ACTIVITIES

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

In 1992/93, the Secretariat developed natural flow computation computer programs for the Beaver River, Gopher Creek, Jackson Creek and Stony Creek. The Secretariat also updated the monthly natural flows of these streams to 1990.

The Secretariat met with the Saskatchewan Cold Lake/ Waterhen River Task Force in the fall of 1992 to discuss questions related to the apportionment of the Cold Lake basin. The Task Force, comprised of representatives from government and the local community, is preparing a report identifying current water uses and issues and making recommendations for a water management plan for the basin.

During the year the staff of the Secretariat participated in several workshops and committees. These activities included participation in the development of a new visitor centre display at Danielson Park on Lake Diefenbaker, chairing a workshop at the 1993 National Water Conservation Conference, and participating at the annual meetings of the Alberta Chapter of the Canadian Water Resources Association and the International Coalition for Land/ Water Stewardship in the Red River Basin.

The Secretariat annually acquires computer tapes from AES containing historical meteorologic records of the prairie provinces. As of March 1992 the tapes provide information to 1990.

PFRA Hydrology Division maintains these tapes for the PPWB. Meteorological data are provided to member agencies upon request.

GROUNDWATER

COMMITTEE ON GROUNDWATER

The Committee met twice during the year on June 22-23, 1992 in Regina, Saskatchewan and on October 21, 1992 in Winnipeg, Manitoba.

The Committee finalized a report entitled "Proposed Implementation Plan for Recommendations in the 1991 COG Report on Evaluation of Groundwater Legislation". The report outlines implementation plans for five specific tasks: groundwater vulnerability mapping; groundwater data base for the prairie provinces; aquifer management plans; groundwater allocation and protection data base; and groundwater guideline development. The report was approved by the Board at its October 1992 meeting.

With respect to the groundwater vulnerability mapping project, the Committee finalized the approach for mapping the transboundary areas, and identified data requirements. The COG began work on this project including providing digitized well-log records to the National Hydrology Research Institute (NHRI).

The Committee monitored groundwater activities associated with heavy oil development in the Cold Lake area. Recent groundwater withdrawals and deepwell injection activities have generated concerns by the residents in the area. The Committee discussed the potential impacts that these activities may have on Cold Lake and groundwater quality of the area.

During the year, Prairie Farm Rehabilitation Administration (PFRA) completed a multi-disciplinary study of groundwater supply potential in east central Alberta. At the recommendation of the Committee, PFRA has agreed to extend the data base for this project to the adjoining areas of Saskatchewan underlain by the aquifers of interest. The Committee will use the results of this study to explore concepts such as the definition of an aquifer management unit and requirements of groundwater data bases.

The Committee reviewed the progress of a NATMAP (Canada's National Geoscience Mapping Program) project to map three areas in the prairies. The Committee noted that the NATMAP project could provide a foundation for future groundwater related work in the region. The project will help to create continuity on groundwater maps between the three prairie provinces.

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" (PPWB Report No. 118). The objective of this mapping project is to produce and publish a series of maps at the interprovincial boundaries which would determine aquifer vulnerability to potential groundwater contamination from surface activities. The project will use a methodology developed by the National Hydrology Research Institute (NHRI) for the PPWB last year. The NHRI will coordinate the project using data supplied by the provinces. At the end of the year, data had been received for six of the 10 map sheets and four preliminary maps had been prepared.

WATER QUALITY

COMMITTEE ON WATER QUALITY

The Committee on Water Quality held a conference call meeting on May 4, 1992 and met on August 25-26, 1992 in Edmonton, Alberta. At the May 4, 1992 meeting, the Committee established a working group to develop the terms of reference for a monitoring frequency study designed to determine the appropriate water quality monitoring frequencies for PPWB sites. This is a joint study with the Environmental Quality and Monitoring Branch, Environmental Assessment Division, Alberta Environmental Protection. The study report will be prepared in 1993-94.

The Committee agreed to consider conducting a Spacial and Temporal Variability Study at one of the PPWB monitoring locations. The results of the study would assist the COWQ in determining an appropriate monitoring frequency for PPWB water quality monitoring sites. The Committee will consider the feasibility of this study next fiscal year.

The COWQ reviewed a proposal by Nova Corporation for a pipeline crossing the South Saskatchewan River and agreed that the project would have no long-term effect on the quality of water crossing the Alberta-Saskatchewan boundary. Reviewing proposed project proposals is one of the COWQ's responsibilities in the protection and enhancement of interprovincial waters.

The Committee revised the PPWB water quality monitoring program for 1992-93 as requested by the Board. The new multi-media monitoring program developed for the eleven interprovincial river reaches involves collection and analysis of water, sediment, and biota. The program will assist in providing information necessary for reporting on the ecosystem health of interprovincial streams. The Committee also developed a long-term water quality monitoring plan.

The Committee reviewed the feasibility of preparing a report on ecosystem health on interprovincial rivers. Following a review of available data, the Secretariat concluded that there is currently insufficient information to prepare the report. In the future, as information becomes available, the Board will be provided with an interpretation of the multi-media monitoring program results. These results will be summarized in future PPWB annual reports.

The Committee also reviewed spills and unusual water quality conditions which were reported under the PPWB Interprovincial Water Quality Contingency Plan. These events are discussed in detail under the heading "Interprovincial Water Quality Contingency Plan".

ANALYTICAL METHODS TASK FORCE

The Analytical Methods Task Force was established, by the Committee on Water Quality in 1980, to determine the comparability of water quality analytical results from Federal and Provincial laboratories. The Task Force continues to review data from the quality assurance program and to assess laboratory comparability.

The Task Force reviewed proposed modifications by the National Water Resources Institute (NWRI) to the Federal/Provincial Quality Assurance Program and agreed to a new quality assurance format that is more cost-efficient for participating laboratories.

The Task Force initiated a quality assurance program for fish samples by arranging for PPWB agency laboratories to

participate in the existing Department of Fisheries and Oceans Mercury, Organochlorines and PCB Fish Tissue Program. The results will be reviewed by the Analytical Methods Task Force.

WATER QUALITY DATA BASE

Since 1974 the Secretariat has maintained a water quality data base. The PPWB data base was updated to include data for the period 1974 to 1991 inclusive. The Secretariat distributed copies of the data base to member agencies.

The Secretariat prepared the report entitled "Interprovincial Water Quality Data at PPWB Monitoring Stations - April 1974 to December 31, 1991". This report summarizes the data and provides plots for all PPWB water quality variables collected since 1974.

MONITORING RESPONSIBILITIES

Environment Canada has conducted monthly or quarterly monitoring of major interprovincial streams for the PPWB since 1974. The results are used to determine if the PPWB Water Quality Objectives are being met and to assist in identifying interprovincial water quality concerns. The monitoring also provides information required to establish baseline characteristics and to detect long-term trends in the aquatic environment. The PPWB monitoring stations are shown on the map in Appendix 3, at the back of the report.

WATER QUALITY OBJECTIVES

On April 2, 1992, the PPWB Water Quality Agreement was signed by the Governments of Alberta, Saskatchewan, Manitoba, and Canada. This agreement became Schedule E to the Master Agreement on Apportionment. 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 users in downstream jurisdictions, evaluate the quality of interprovincial waters and advise the Board on potential interprovincial water quality concerns.

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

A review of the water quality data collected at the PPWB monitoring stations indicates that most objectives were met in the 1992 calendar year. The percent adherence to the PPWB Water Quality Objectives in 1992 is shown on the next page. Caution must be taken in comparing these results with the 1991 results, since the monitoring frequency and parameter list for some PPWB stations has changed.

In 1992 the PPWB reach specific water quality objectives, on average, were adhered to 96% of the time. The North Saskatchewan River (100%), the Churchill River (100%), the Red Deer River (99%) at the Saskatchewan-Manitoba boundary and the Beaver River (99%) stations showed the greatest adherence to the PPWB objectives. The minimum dissolved oxygen level of 6.0 to 6.5 mg/litre was maintained at all PPWB locations during the open water period. The Assiniboine, Carrot, Battle and Beaver Rivers were the only sites which periodically displayed dissolved oxygen levels below the PPWB objective during the winter.

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

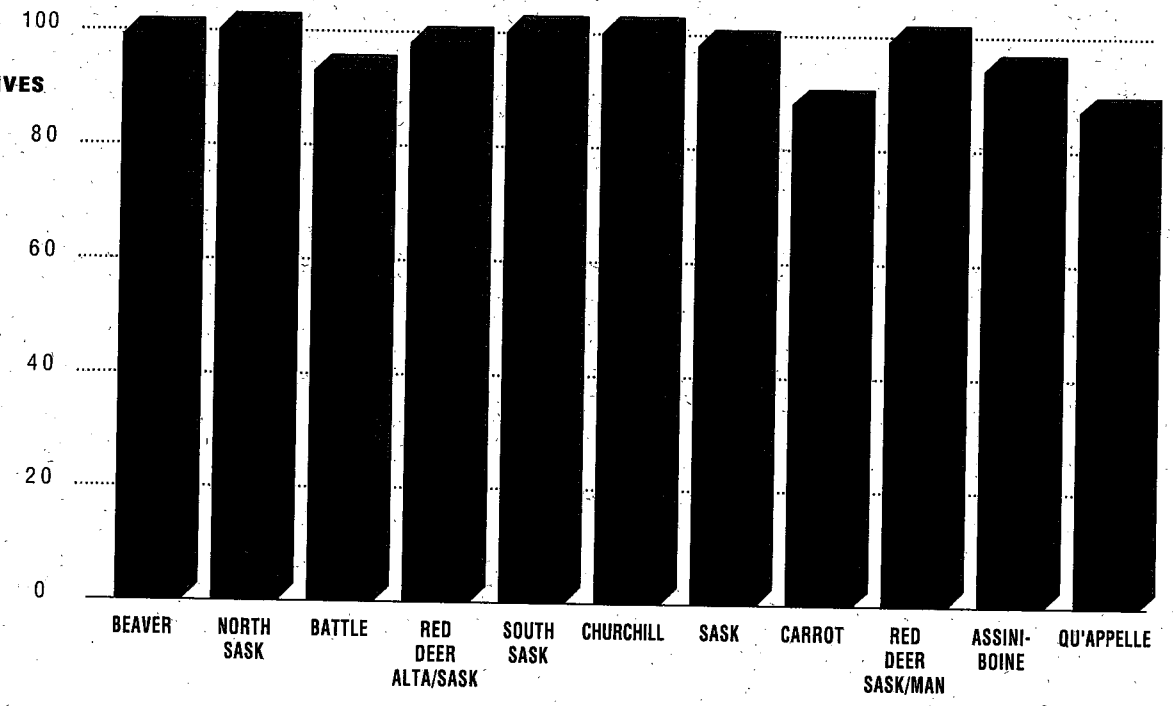
most interprovincial river reaches. The objectives for these three constituents were exceeded on many occasions in the Qu'Appelle and Carrot Rivers. The sodium objective was exceeded several times in the Battle and exceeded once in the Assiniboine River at the interprovincial boundary.

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 (500 mg/litre) objective at this site was exceeded on a few occasions during the fall and winter months.

The total lead objective was adhered to 100% of the time at PPWB sites except at the Red Deer River near Bindloss site where the percentage adherence was 92%. The manganese dissolved objective was met 100% of the time at all sites except for the Carrot, Qu'Appelle and Assiniboine River sites. Total chromium was also adhered to 100% of the time at all but one PPWB site. The percent adherence for the South Saskatchewan River site was 92%.

Dissolved iron was adhered to 100% of the time at most locations. The two exceptions were the Battle River and the Red Deer River at Bindloss where the iron objective for each site was adhered to 92% of the time. Total mercury was also adhered to 100% of the time at all but one location. The percent adherence to the objective for total mercury in the Qu'Appelle River was 75%. Total copper was adhered to 100% of the time with the exception of the Battle River and the Red Deer River near Bindloss. The percent adherence of copper total in the Battle River was 75% and in the Red Deer River was 58%. No other trace metal objectives were exceeded at PPWB sites.

1992 Percent Adherence to PPWB Objectives



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, Battle, Beaver, North Saskatchewan, Saskatchewan Rivers and the Red Deer River at Bindloss, to 90% for the Red Deer at Erwood, 80% for the Carrot River, 60% for the Saskatchewan River, to as low as 0% for the Assiniboine and Qu'Appelle Rivers. Data reviews and water quality studies on the Assiniboine and Qu'Appelle Rivers will be conducted in 1993.

Pesticides such as DDT, Aldrin, Dieldrin, Endrin, Heptachlor and MCPA were not detected at any of the PPWB river reaches during 1992. Tordon was detected twice in the Battle River and once in the North Saskatchewan River at the interprovincial boundary. Atrazine was detected once in the Saskatchewan River at the interprovincial boundary.

The herbicide Lindane was detected three times in the North Saskatchewan and South Saskatchewan Rivers and once in the Saskatchewan River.

Alpha BHC was detected at trace levels once in the South Saskatchewan River and once in the Saskatchewan River. Traces of 2,4-D were detected in the North Saskatchewan River and the Saskatchewan River. Traces of 2,3,6-TBA were only found in the Saskatchewan River at the Saskatchewan-Manitoba boundary.

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 determine the cause of excursions to the objectives at the Assiniboine River site and the study will continue in 1992/93. A data review of nutrients in the Qu'Appelle River will be conducted in the 1993/94.

INTERPROVINCIAL WATER QUALITY CONTINGENCY PLAN

In 1992 the PPWB Interprovincial Water Quality Contingency Plan was effective in keeping Board agencies informed of spills and unusual water quality conditions in interprovincial streams. Two spills were reported to member agencies during the year. The first spill occurred on February 16-17, 1993, and involved a spill of 8 000 litres of hydrofluosilicic acid into the North Saskatchewan at Edmonton. The source of the spill was from the City of Edmonton water treatment plant. The spill had no effect on the quality of water crossing the Alberta-Saskatchewan boundary.

A second spill occurred on March 7, 1993 when 21 000 litres of toxic oil field fluid was leaked from a tanker truck into a ditch draining to North Raven Creek (a tributary to the Red Deer River). Much of the material was recovered and Alberta Fish and Wildlife Branch is closely monitoring fish populations in the creek downstream. The spill appeared to have no effect on the water quality at the interprovincial boundary.

STUDIES

Trend Assessment Study

Water quality trend assessments are an essential component of the PPWB monitoring program. These assessments along with a review of excursions to the PPWB objectives assist in identifying potential

interprovincial water quality concerns. The detection and analysis of long-term trends requires careful data verification and data continuity over time.

The Secretariat prepared a draft water quality trend report for the North Saskatchewan River at the Alberta-Saskatchewan boundary. The report involved a detailed verification of the data base and a review of the changes in analytical methodology for the period 1974 to 1991. A series of seventeen non-parametric trend analysis tests were conducted along with time series plot and best fit lines to determine actual trends in water quality in the North Saskatchewan River and to identify constituents of potential concern.

Monitoring Frequency Study

A monitoring frequency study was initiated in early 1993 by Alberta Environmental Protection and the Prairie Provinces Water Board to determine optimum monitoring frequency for some 25 water quality variables in the North Saskatchewan River. The study will review data from three monitoring sites on the North Saskatchewan River. A final report is expected in the fall of 1993.

Assiniboine River/Shellmouth Reservoir Studies

In 1992/93 Saskatchewan Environment and Resource Management, in cooperation with the PPWB, completed a pilot study on the Assiniboine River near the Saskatchewan/ Manitoba boundary. The study was designed to determine if excursions to dissolved oxygen, sodium, total phosphorus and manganese objectives are a result of effluent discharges from the City of Kamsack sewage lagoon. Sample collection and analysis is complete and a final report will be prepared next fiscal year.

The Shellmouth Reservoir study conducted by Manitoba Environment, Saskatchewan Environment and Public Safety, Environment Canada and the PPWB is near completion. Sample collection and analysis is completed and interpretation of the study results is underway. The study will assist the PPWB in determining nutrient monitoring frequencies necessary to determine accurate nutrient loads to Shellmouth Reservoir. A final report will be completed in 1993-94.

SECRETARIAT ACTIVITIES

In addition to the activities previously described for 1992/ 93 the Secretariat:

- modified and tested programs used to produce summary data and graphics for the PPWB water quality report;
- prepared an excursion report to the PPWB Water Quality Objectives;
- reviewed and updated the PPWB Water Quality Monitoring Program;
- loaded water quality summary data on Spans Map system and tested GIS mapping capabilities;
- ran trend assessment programs on the North Saskatchewan River and Qu'Appelle River data for the interpretative trend report;
- reviewed and commented on ENVIRODAT detailed data and summary report formats;
- verified calculated data results for all PPWB water quality monitoring sites and recalculated and updated data files with the appropriate calculation methods.

PPWB Water Quality Monitoring 1992 Parameter List

Water (Monthly collection at all sites)

Alkalinity, phenol.
Alkalinity, total
Aluminum, dissolved
Aluminum, ext.
Boron (diss)
Barium, total
Bicarbonate, calc.
Cadmium, total
Calcium, diss.
Carbon, diss., organic
Carbon, organic, particulate
Carbonate, calc.
Chloride, diss.
Chromium, total
Cobalt, total
▲ Coliforms, fecal
▲ Coliforms, total
Color, true
Copper, total
Fluoride, diss.
Free CO_2
Hardness, non-carbonate
Hardness, total $CaCO_3$
Iron, diss.
Lead, total
Manganese, diss.
Magnesium, diss.
Mercury, total
Nickel, total
Nitrogen, diss., NO_3+NO_2
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 5 sites ■)

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

Fish (Fall collection at 3 sites ●)

Arsenic & Selenium
Chlorophenolics
Dioxins & Dibenzofurans
Lipids
Neutral Herbicides
Polyaromatic Hydrocarbons
Mercury total
Total Metals
Molybdenum, total

▲ Collected 8 times a year
■ Collected from N. Sask. R., S. Sask. R., Sask. R., Red Deer R. A/S, and Red Deer Lake
● Collected from N. Sask. R., S. Sask. R. and Sask. R.

1992 Flow Data

RECORDED AND NATURAL FLOWS, CONSUMPTIVE USE, DIVERSION, AND STORAGE (in Cubic Decametres) FOR THE 1992 APPORTIONMENT PERIOD

SOUTH SASKATCHEWAN RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	210 000	199 000	264 000	94 100	102 000	398 000	680 000	313 000	262 000	342 000	310 000	220 000	3 394 100
COMSUMPTIVE USE	-180	-250	-350	274 450	478 090	369 250	208 330	199 080	59 710	-3 660	-1 550	-290	1 582 630
CHANGE IN STORAGE	-76 920	-70 940	-64 450	-119 420	-13 420	328 350	351 890	37 000	46 660	22 320	-47 150	-65 710	328 210
DIVERSION FROM BASIN	0	0	0	1 730	27 140	35 820	33 540	37 260	23 680	17 030	0	0	176 200
NATURAL FLOW ALTA.BDY.	135 620	128 330	198 120	171 460	512 310	1 176 750	1 305 580	623 270	404 200	395 880	278 100	157 020	5 486 640

RED DEER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

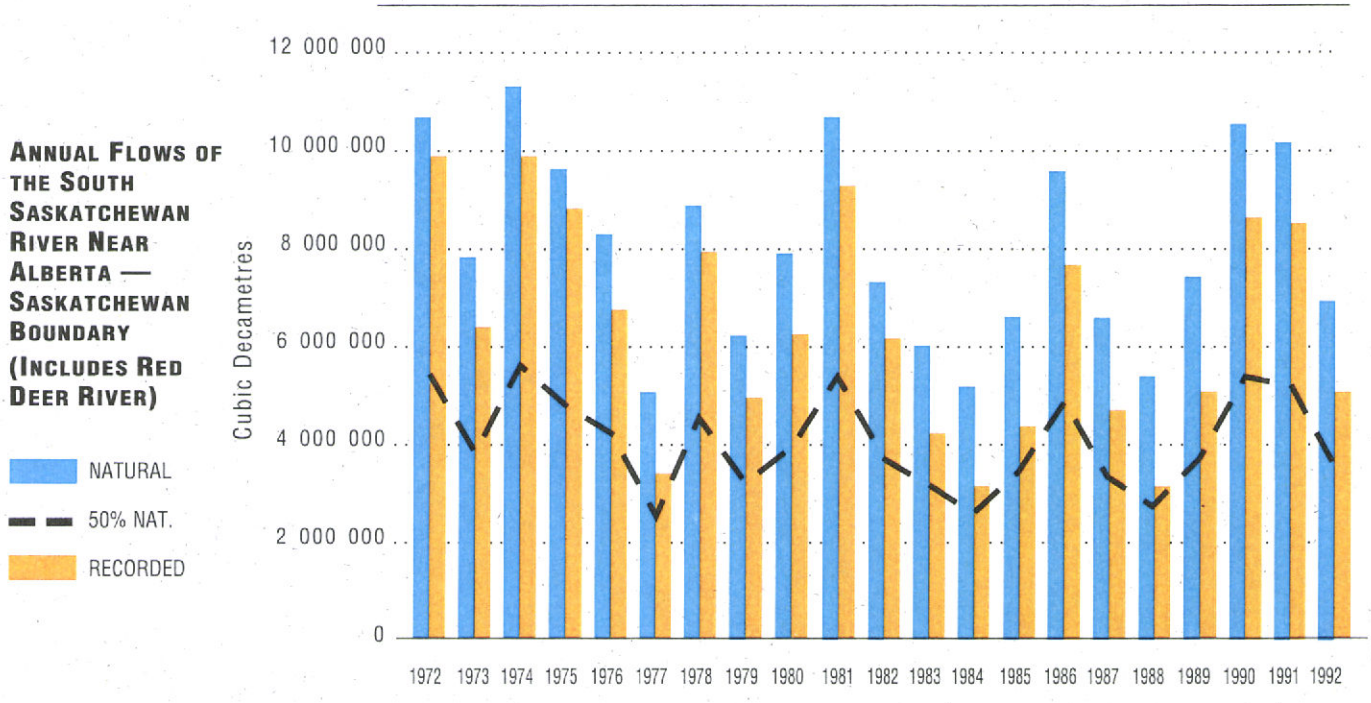
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	46 300	43 300	156 000	114 000	109 000	295 000	333 000	193 000	113 000	99 900	80 500	37 900	1 620 900
COMSUMPTIVE USE	0	0	0	1 460	5 370	4 710	3 090	4 250	2 480	-230	0	0	21 130
CHANGE IN STORAGE	-19 630	-17 990	-860	-16 740	29 180	42 340	8 540	16 700	14 490	830	-7 230	-28 010	21 620
DIVERSION INTO BASIN	0	0	0	-1 730	-27 140	-35 820	-33 540	-37 260	-23 680	-17 030	0	0	-176 200
NATURAL FLOW ALTA.BDY.	24 900	25 700	152 680	98 040	94 520	326 650	310 190	175 400	107 460	84 310	76 750	13 120	1 489 720

SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER

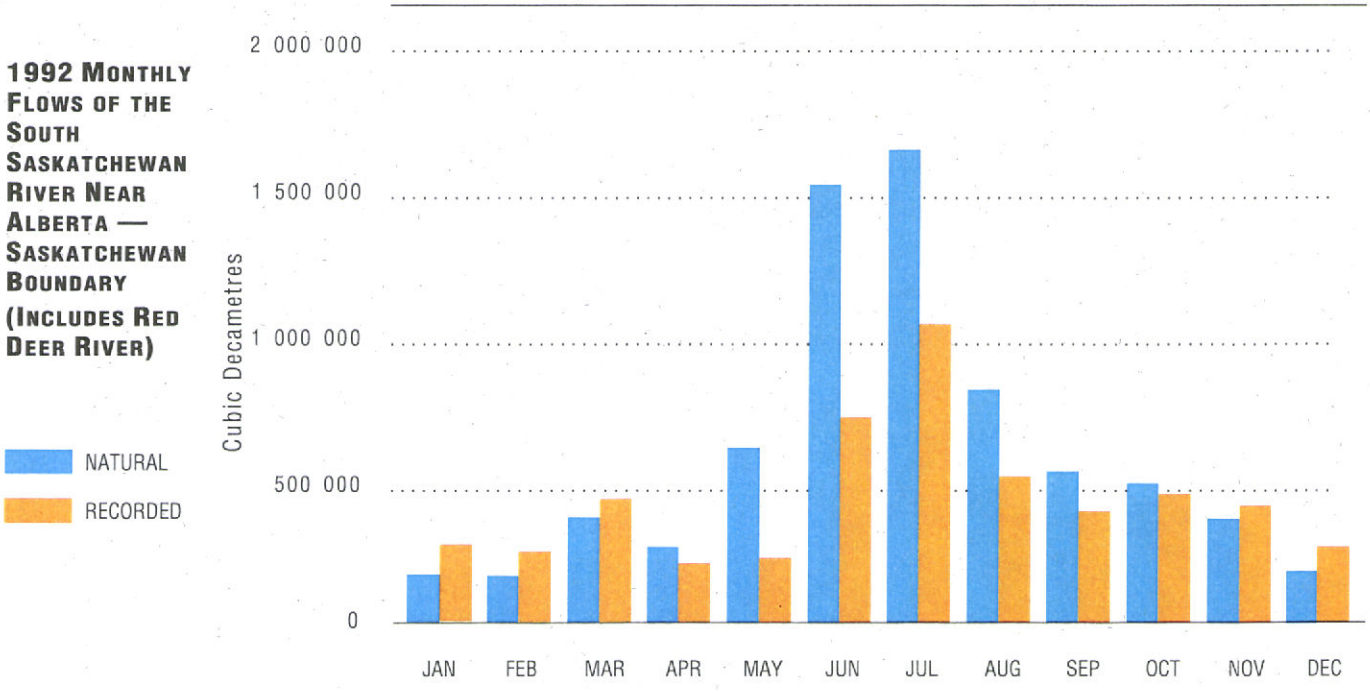
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	256 000	243 000	420 000	208 000	211 000	693 000	1 013 000	506 000	375 000	442 000	391 000	258 000	5 016 000
NATURAL FLOW	161 000	154 000	351 000	269 000	607 000	1 503 000	1 616 000	799 000	512 000	480 000	355 000	170 000	6 977 000

Natural flows for the South Saskatchewan and Red Deer Rivers have been calculated using WSC's 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)



1992 MONTHLY FLOWS OF THE SOUTH SASKATCHEWAN RIVER NEAR ALBERTA — SASKATCHEWAN BOUNDARY (INCLUDES RED DEER RIVER)



RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THESASKATCHEWAN-MANITOBA BOUNDARY (in Cubic Decametres) FOR THE 1992 APPORTIONMENT PERIOD

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

	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.	TOTALS
RECORDED FLOW	1 570 000	1 740 000	1 580 000	1 500 000	1 490 000	1 400 000	1 600 000	1 660 000	1 710 000	1 780 000	1 550 000	1 730 000	19 310 000
NATURAL FLOW	1 400 000	1 810 000	2 030 000	1 950 000	1 850 000	1 610 000	1 570 000	1 380 000	1 410 000	1 450 000	1 160 000	1 310 000	18 930 000

SASKATCHEWAN RIVER - SASKATCHEWAN-MANITOBA BOUNDARY

ESTIMATED FLOW	1 420 000	1 160 000	968 000	1 050 000	785 000	613 000	797 000	890 000	510 000	728 000	828 000	722 000	10 471 000
APPORTION-MENT FLOW	1 670 000	1 280 000	1 390 000	1 700 000	1 260 000	861 000	835 000	743 000	118 000	312 000	554 000	809 000	11 532 000

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

RECORDED FLOW	36 600	11 600	7 900	4 660	5 020	5 740	17 600	22 200	13 900	10 200	7 010	6 580	149 010
NATURAL FLOW	47 277	13 376	6 787	1 576	327	75	0	0	0	0	0	20 433	89 851

CARROT RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR TURNBERRY)

RECORDED FLOW	40 800	52 600	11 100	10 200	6 200	11 200	11 000	5 150	3 340	2 160	1 290	9 220	164 260

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

RECORDED FLOW	35 200	38 300	8 200	8 270	7 290	6 310	4 890	3 740	3 080	1 470	791	2 610	120 151

ASSINIBOINE RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (AT KAMSACK)

RECORDED FLOW	49 900	19 700	2 200	2 100	299	617	886	887	712	601	475	2 670	80 147

RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THE ALBERTA-SASKATCHEWAN BOUNDARY (in Cubic Decametres) FOR THE 1992 APPORTIONMENT PERIOD

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

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	310 000	360 000	541 000	678 000	553 000	756 000	717 000	416 000	327 000	324 000	336 000	250 000	5 568 000
NATURAL FLOW	79 500	109 000	310 000	439 000	573 000	939 000	1 300 000	808 000	468 000	320 000	105 000	32 900	5 483 400

BATTLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	201	669	517	341	377	674	265	313	348	-	-	3 705
NATURAL FLOW	-	201	669	543	394	464	764	283	314	348	-	-	3 980

LODGE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	3	55	12	7	-	202	-	1	-	-	-	280
NATURAL FLOW	-	15	80	42	1	2	282	20	7	-	-	-	449

MIDDLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	5	32	33	20	26	22	8	8	14	-	-	168
NATURAL FLOW	-	11	26	34	22	30	34	19	5	16	-	-	197

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

RECORDED FLOW	2 320	2 680	6 320	13 200	8 920	10 200	5 010	2 790	2 720	4 370	3 370	2 020	63 920

BATTLE RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	3 560	2 710	31 800	61 700	26 900	17 000	7 090	2 400	1 100	2 070	1 950	1 490	159 770

Appendix I

Statement of Expenditures and Final Claim

PRAIRIE PROVINCES WATER BOARD
STATEMENT OF EXPENDITURES AND
FINAL CLAIM

FINANCIAL YEAR
1992/93

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 92/93	EXPENDITURES
Salaries:		
(01) Permanent Staff	$ 270 000	$ 239 314
(02) Temporary Staff	0	25 575
(03) Overtime/Other Pay	0	2 026
TOTAL SALARIES	$ 270 000	$ 266 915
O & M:		
(07) Travel	$ 19 700	$ 16 147
(09) Postage	1 700	1 537
(10) Telecommunications	6 400	5 531
(15) Printing	11 800	11 094
(18) Profess. Services	29 000	23 561
(19) Training	3 000	504
(20) Temporary Help	3 500	57
(21) Personal Services	33 400	33 370
(22) Other Services	8 050	4 226
(25) Rentals	37 700	37 783
(28) Equipment Repair	3 000	608
(33) Purchased Materials	6 000	4 447
(35) Parts & Consumables	2 300	7 191
(41) Equipment Acquisition	2 900	3 894
TOTAL O & M	$ 168 450	$ 149 950
TOTAL SALARIES AND O & M	$ 439 150	$ 416 865
FRINGE BENEFITS *	$ 24 400	$ 21 538
TOTAL EXPENDITURES	$ 463 550	$ 438 403

** Nine percent of Permanent Salaries*

Each province's share (one-sixth of the total amount of $438 403) is $73 067.

FINAL CLAIM **$ 73 067**

APPENDIX II

BOARD/COMMITTEE MEMBERSHIP

PPWB MEMBERS

CHAIRMAN	B.M. Burns (Oct/92)	Director General Inland Waters Directorate Western and Northern Region Conservation and Protection Environment Canada
	D.L. Egar (Jan/92 - Oct/92)	Director General Ecosystem Sciences and Evaluation Directorate Conservation and Protection Environment Canada
	H.M. Hill	Director General Prairie Farm Rehabilitation Administration Agriculture Canada
	P.G. Melnychuk	Assistant Deputy Minister Water Resources Management Service Alberta Environmental Protection
	W.L. Dybvig	Vice President Water Management Division Saskatchewan Water Corporation
	L.J. Whitney	Water Resources Branch Manitoba Natural Resources
SECRETARY	G.W. Dunn	Water Quality Specialist Prairie Provinces Water Board

PPWB Alternate Members

R.A. Halliday	Director Inland Waters Directorate Western and Northern Region Conservation and Protection Environment Canada
A.F. Lukey	Director Engineering Service Prairie Farm Rehabilitation Administration Agriculture Canada
K.R. Smith	Assistant Deputy Minister Environmental Protection Services Alberta Environmental Protection
B.G. Collins (Nov/92)	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
	G.H. Morton	Water Resources Branch Environment Canada
	F.R.J. Martin	Prairie Farm Rehabilitation Administration Agriculture Canada
	A.M. Mustapha	Water Resources Management Services 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 Environment Service Environment Canada
SECRETARY	A.J. Chen	Operations Engineer Prairie Provinces Water Board

COMMITTEE ON WATER QUALITY

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.

Approved: October 17, 1991
PPWB Minute 47-54

MEMBERS

CHAIRMAN	R.L. Kellow	Executive Director Prairie Provinces Water Board
	W.D. Gummer	Water Quality Branch Environment Canada
	M. Morelli	Environmental Quality Standards Branch Manitoba Environment
	R.G. Ruggles	Water Quality Branch Saskatchewan Environment and Public Safety
	J.B. Kemper	Environmental Quality Monitoring Branch Alberta Environmental Protection
	E.W. Allison	Prairie Farm Rehabilitation Administration Agriculture Canada
SECRETARY	G.W. Dunn	Water Quality Specialist Prairie Provinces Water Board

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.

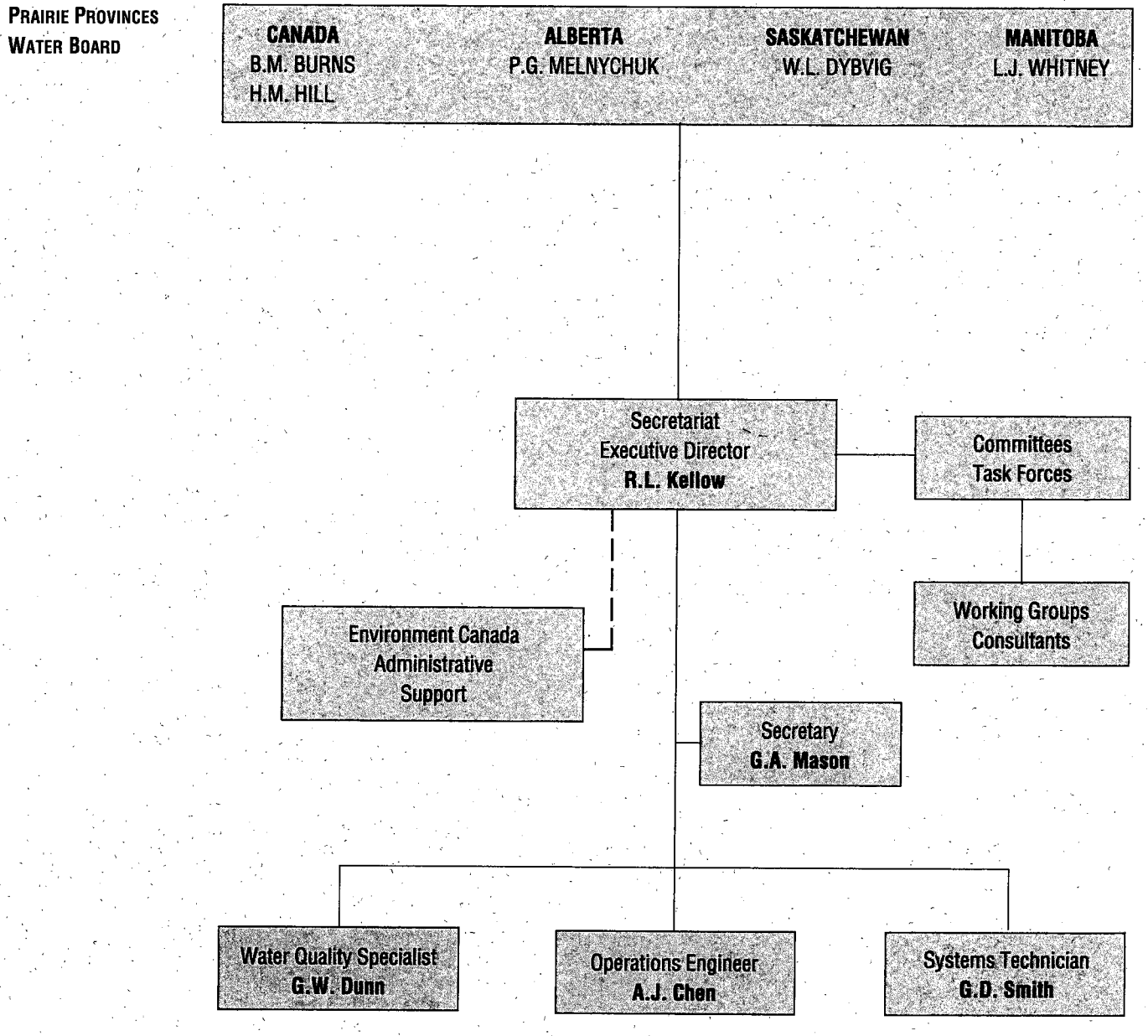
Responsibilities of the Committee will include: exchange of information; compilation and interpretation of existing data; recommendations on groundwater information and monitoring requirements; determination of implications of proposed projects which may impact the quantity and/or quality of waters at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

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

MEMBERS

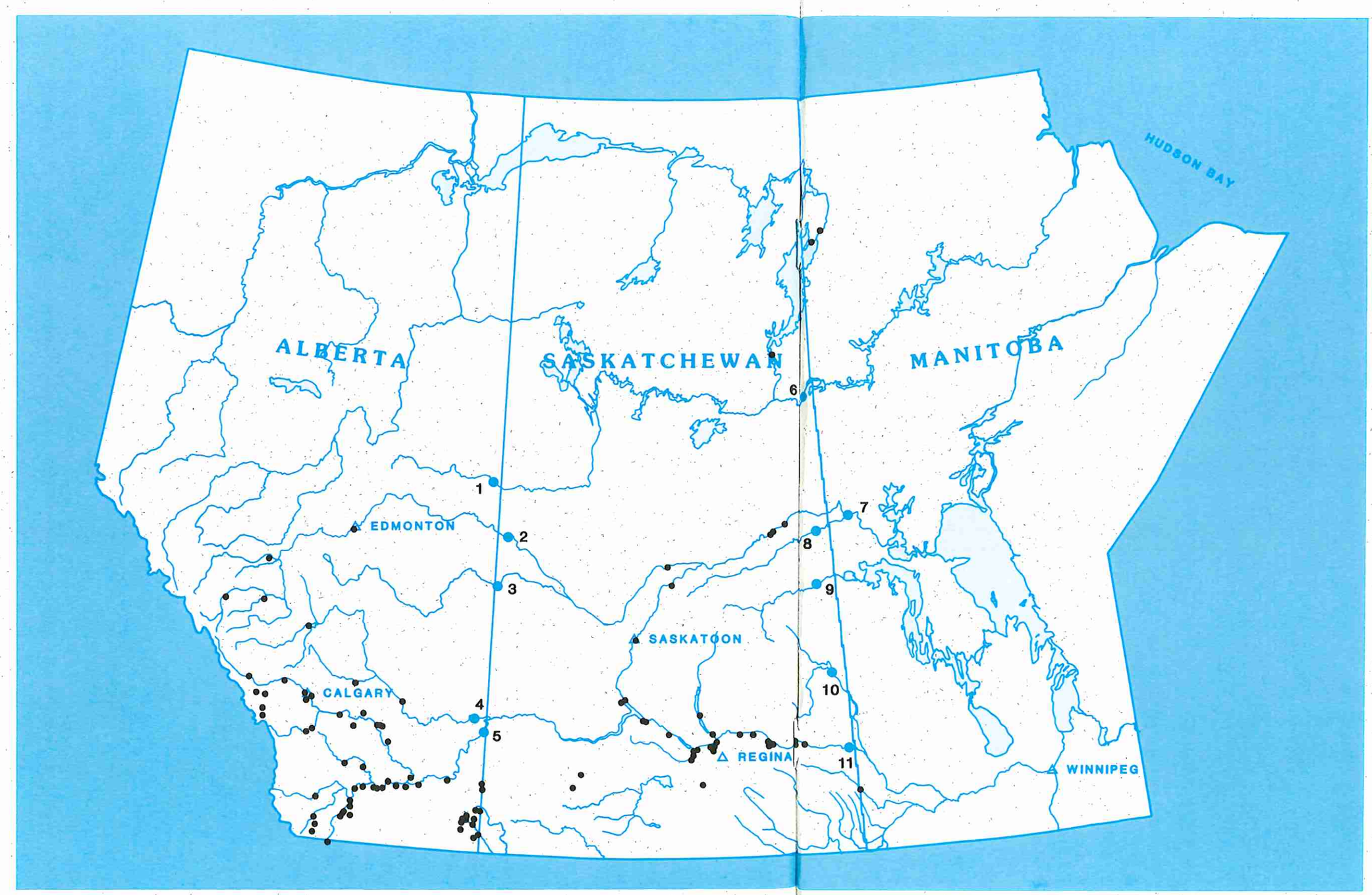
CHAIRMAN	R.L. Kellow	Executive Director Prairie Provinces Water Board
	G.D. Grove	Environmental Science Division National Hydrology Research Institute Environment Canada
	J. Lebedin	Earth Sciences Division Prairie Farm Rehabilitation Administration Agriculture Canada
	H.A. Kerr (May/80 - Dec/92)	Groundwater Protection Branch Alberta Environmental Protection
	N. Shaheen	Water Management Division Saskatchewan Water Corporation
	L. Gray	Water Resources Branch Manitoba Natural Resources
SECRETARY	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. Beaver River
  2. North Saskatchewan River
  3. Battle River
  4. Red Deer River (Alta./Sask.)
  5. South Sask. River
  6. Churchill River
  7. Saskatchewan River
  8. Carrot River
  9. Red Deer River (Sask./Man.)
  10. Assiniboine River
  11. Qu'Appelle River
- Hydrometric Sites used for apportionment monitoring

NOTES