ANNUAL REPORT • 1991

CANADA

SASKATCHEWAN-MANITOBA

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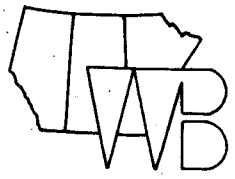
PRAIRIE
PROVINCES
WATER
BOARD



PRAIRIE PROVINCES WATER BOARD

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ANNUAL REPORT

FOR THE YEAR ENDING MARCH 31, ~~1992~~ 1993

ISSN 0704-8726

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LETTER OF TRANSMITTAL

September 11, 1992

Honourable Jean J. Charest
Minister of the Environment
Ottawa, Canada

Honourable Darrel Cunningham
Minister Responsible for
Saskatchewan Water Corporation
Regina, Saskatchewan

Honourable Ralph Klein
Minister of Environment
Edmonton, Alberta

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

Honourable Bill McKnight
Minister of Agriculture
Ottawa, Ontario

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, 1992.

Yours truly,

D.L. Egar, Chairman

Message From The Executive Director

Recent years have seen a dramatic increase in the concern about the quality of our water. For the Prairie Provinces Water Board, responding to this issue while recognizing the continued importance of water supply questions means an evolving mandate.

The best example of this is PPWB's efforts in 1991/92 to finalize a new water quality agreement. It will set water quality objectives at 11 interprovincial river reaches, define PPWB's role and ensure the signatory parties take practical measures to maintain or improve existing water quality.

While water quality of interprovincial streams continued to be good during the year, with an average of 95 percent adherence to objectives, the need to progress beyond compliance monitoring received high priority. A major report on water quality trend assessment, which allows early detection and resolution of potential problems, was completed for the PPWB by the National Water Research Institute. This information, together with the results of a PPWB workshop of experts, will help guide future trend assessment work at PPWB monitoring locations.

The Analytical Methods Task Force, in an ongoing commitment to improve accuracy and comparability of water quality data, completed a report on the 1985-90 results of the interlaboratory quality assurance program.

In 1991/92 water apportionment conditions were fully met on all interprovincial streams. On the South Saskatchewan River, Alberta delivered 83 percent of the total annual natural flow and met the minimum flow criteria at all times. Due to continued dry conditions in the Lodge and Middle Creek basins, the Board maintained the increased monitoring started last year. Alberta met its apportionment obligation in these basins.

PPWB contracted Sask Water to modify and adapt the Qu'Appelle River SSARR model to run on microcomputer. The PPWB Secretariat will use the model to prepare the annual apportionment report on the Qu'Appelle River.

During the year two significant groundwater reports were completed. The first report by the Committee on Groundwater reviews groundwater legislation, regulations and policies in the prairie provinces.

The second report addresses groundwater vulnerability mapping. Prepared for the PPWB by the National Hydrology Research Institute, the report outlines an approach to map groundwater susceptibility to surface contamination. The approach will be considered next year for possible use in mapping aquifers along interprovincial boundaries.

The year saw the Water Use Coordinators meet for the first time since the completion of the 1982 PPWB Water Demand Study. They discussed procedures for updating the water use data base. The updating will begin next fiscal year, with a summary report available in 1993/94.

As always, the success of projects year-round involved the efforts of all Board and committee members. Appreciation is also extended to everyone responsible for providing timely hydrometric, meteorologic and water quality data required to carry out the PPWB's mandate.

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, 1991, to March 31, ~~1992~~ 1993.

The Board met once during ~~1991/92, October 17, 1991, in Edmonton, Alberta.~~

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

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 ~~1991/92~~ 1992/93, the Secretariat hired a computations technician under contract to do drafting, 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 ~~1991/92~~ 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 ~~1992~~ 1993 meeting, the Board approved the ~~1992/93~~ 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 ~~8 524 000~~ 5016000 cubic decametres (dam³) in the South Saskatchewan River, at the point below its junction with the Red Deer River, represented ~~83~~ 72 percent of the total annual natural flow of ~~10 214 000~~ 6977 000 dam³. A summary of recorded and natural flow volumes for ~~1991~~ 1992 at this apportionment point is shown in table and graph form on pages 18 and 19.[1]

From January 1 to December 31, ~~1991~~ 1993 daily recorded discharges of the South Saskatchewan River at the apportionment point were 42.5 m³/s (1500 ft³/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, ~~1991~~ 1992 and March 31, ~~1992~~ 1993, was ~~89 000~~ dam³. Recorded flow augmented by releases of ~~120 200~~ dam³ from Lake Diefenbaker, was ~~170 440~~ dam³. Recorded and natural flows covering April 1, ~~1991~~ 1992 to March 31, ~~1992~~ 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, ~~Lodge~~ and Middle Creeks' natural flow at the interprovincial boundary was passed to Saskatchewan. Recorded and natural flow data for these three creeks are shown on page 21.

[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.

April 13-14, 1992 in Winnipeg, Manitoba, on September 10, 1992 in Regina, Saskatchewan and on March 8-9, 1993 in Calgary, Alberta.

See Insert A

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, ~~1991~~ 1992 to March 31, ~~1992~~ 1993 the recorded flow on the Pipestone at the boundary was ~~20 270~~ dam³, compared to a natural flow of ~~[illegible]~~ dam³ — an excess flow of ~~3027~~ dam³.

COMMITTEE ON HYDROLOGY

The Committee on Hydrology met ~~twice~~ three during the year on ~~October 2-3, 1991 in Edmonton, Alberta.~~

During this meeting, the Committee discussed the modified version of the Qu'Appelle River SSARR natural flow model, prepared by the Saskatchewan Water Corporation, and agreed that the Secretariat should be responsible for running the model starting in 1992. A ~~training workshop was held on the operating procedures of the SSARR model.~~

Due to financial constraints, Water Resources Branch, Environment Canada terminated a few PPWB hydrometric monitoring stations in Alberta. The Board agreed with the Committee's recommendation that any future modifications to the PPWB monitoring network will be done in consultation with the COH.

The Committee agreed that a natural flow study for Lodge and Middle Creeks should be undertaken. The study would review procedures for determining natural flow and provide an update of the data base for these two streams. Alberta Environment agreed to undertake the study in 1992/93.

In response to concerns regarding apportionment monitoring of Lodge Creek, the COH conducted a field trip on April 25, 1991 to the Lodge Creek basin. Ways to improve apportionment monitoring were considered during the field trip, including having Sask Water provide, each year, pumpage information for inclusion in the natural flow computation.

The Committe reviewed problems of low flows in the Waterhen River basin. Below normal precipitation in recent years has caused a decline in lake levels in the Cold Lake region.

The Committee reviewed a draft of the report entitled "Pipestone Creek Natural Flow at the Saskatchewan-Manitoba Boundary". The report is expected to be finalized in 1992/93. The Committee also reviewed a draft of the report entitled "Strategy for Apportionment Monitoring of Small Interprovincial Streams". The Committee noted that in the determination of potential for

While only 62% of the Lodge Creek's natural flow at the interprovincial boundary was passed to Saskatchewan causing an apportionment deficit of 56 dam³

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The report was reviewed and approved by the Committee on Hydrology in September 1992.

apportionment monitoring, the emphasis should be placed on the need for apportionment rather than on the suitability of the existing hydrometric network in each basin. It is anticipated that this report will be finalized in 1992/93.

STUDIES

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. ~~Drafts of the natural flow study report have been reviewed by the COH. The study is expected to be completed in fiscal year 1992/93.~~

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

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 ~~1991~~ was ~~1799~~ dam³. During the same period, the four provincial reservoirs stored ~~1629~~ dam³ and released ~~705~~ dam³ to the Boxelder Creek system. Based on the responses of the ~~1991~~ water use survey, conducted by the Saskatchewan Water Corporation, ~~dam³~~ was diverted for irrigation purposes in the Saskatchewan portion of the Boxelder Creek basin.

ANNUAL REPORT ON INTERPROVINCIAL DRAINAGE PROJECTS

The Board accepted a 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 ~~1991~~ Saskatchewan licensed ~~16~~ 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.

A meeting of the Water Use Coordinators was held on January 14-15, 1992 in Regina. This group will be responsible for undertaking an update of the data base ~~next~~ fiscal year.

SECRETARIAT ACTIVITIES

Updating of PPWB Monthly Natural Flow Estimates

The Secretariat is responsible for maintaining monthly natural flow estimates for selected hydrometric sites in the Saskatchewan-Nelson basin.

In ~~1991/92~~, the Secretariat developed natural flow computation computer programs for the ~~Overflowing River, Red Deer River, Swan River and Woody River~~. The Secretariat also updated the monthly natural flows of these streams to ~~1989~~ 1990.

Access to AES Meteorological Data

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 ~~1989~~ 1991.

PFRA Hydrology Division maintains these tapes for the PPWB. Meteorological data are provided to member agencies upon request. ~~Due to the availability of meteorological data on CD-ROM, it was decided that this service be discontinued in 1993/93.~~

Modifications to the Qu'Appelle River SSARR Model

During the year the Secretariat made a number of changes to manipulate the input and output data to make the model run more efficiently.

GROUNDWATER

COMMITTEE ON GROUNDWATER

Insert B

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GROUNDWATER

COMMITTEE ON GROUNDWATER

The Committee met twice during the year on June 3, 1991 in ~~Saskatoon~~, Saskatchewan, and

on January 28-29, 1992 in Winnipeg, Manitoba.

At the June 1991 meeting, the Committee noted that the Prairie Farm Rehabilitation Administration (PFRA) is conducting a project to explore several deep bedrock aquifers in east central Alberta. As a part of this project, PFRA will undertake the development of a Geographic Information Systems (GIS) compatible data base and georeferenced base plan designed to compile and analyze available information. The Committee recommended that this project be extended to include adjoining areas of Saskatchewan underlain by the aquifers of interest.

The Committee reviewed a project proposal (NATMAP), prepared by the Geological Survey of Canada, to map the surficial/quaternary deposits in the southern prairie region. The Committee agreed with the general approach outlined in the project proposal.

During the course of the year, the COG was actively involved in the National Hydrology Research Institute (NHRI) groundwater protection mapping pilot study being done for the PPWB. The Committee members provided data input into the study as well as developing study terms of reference and reviewing draft reports. The final report "AVI: A Method for Groundwater Protection Mapping in the Prairie Provinces of Canada" was completed at the end of the fiscal year.

STUDIES

Groundwater Legislation Review

The COG report entitled "An Evaluation of Existing Groundwater Legislation in the Prairie Provinces" was approved by the Board at its March 1991 meeting. The Board directed the COG to prepare strategies for recommendations that require immediate implementation as identified in the report. Discussion regarding the strategy plans took place at both Committee meetings. The report is expected to be finalized in 1992/93.

Groundwater Protection Mapping Pilot Study

The Board, at its March 1991 meeting, agreed with the COG recommendation that a pilot study should be undertaken in 1991/92 to develop groundwater constraint maps along the interprovincial boundaries. Groundwater protection mapping is one technique to help prevent groundwater contamination from surface activities.

In August 1991, the PPWB signed a contract with the National Hydrology Research Institute, Environment Canada for a pilot "groundwater protection" mapping study. This pilot study was to examine a portion of the Saskatchewan-Alberta boundary region covering 29 kilometres (18 miles) either side of the border. Specific objectives of the study were: to map various degrees of susceptibility to groundwater pollution and indicate areas where information is insufficient; to recommend guidelines or criteria that should be used in the mapping; and to estimate the cost of extending the mapping program along the interprovincial borders. The final report "AVI: A Method for Groundwater Protection Mapping in the Prairie Provinces of Canada" was completed in March 1992.

WATER QUALITY

COMMITTEE ON WATER QUALITY

The Committee on Water Quality met on May 2-3, 1991 in Burlington, Ontario, on

December 10, 1991 in Winnipeg, Manitoba and by Conference Call on March 30, 1992.

At the May 1991 meeting, the Committee approved the report entitled, "Trend Assessment Techniques: Application to Prairie Provinces Water Board Water Quality Data Set" prepared for the PPWB by Dr. El-Shaarawi of National Water Research Institute (NWRI). The report reviews trend assessment techniques and provides a preliminary application of trend analysis techniques to data from the 11 PPWB monitoring sites.

The Committee approved the Analytical Methods Task Force report entitled, "Report on Assessing the Comparability of Water Quality Data Generated by the Federal (IWD) and Provincial Laboratories on the Prairies" and agreed with its recommendations. Participating PPWB laboratories will use the report to improve their performance through the application of new sampling techniques and alternate analytical methodologies. The COWQ further agreed that the Federal/Provincial Quality Assurance Program should be expanded to include multi-media samples.

PPWB Water Quality Objectives were approved by the Board in 1991. These objectives apply to the 11 major interprovincial river reaches. The water quality objectives are included in a new PPWB Water Quality Agreement (Schedule E to the Master Agreement on Apportionment) which was being signed at the end of the year. The agreement defines the role of the Board in interprovincial water quality and reflects the Federal and Provincial governments' commitment to maintaining and improving the quality of interprovincial water courses.

A multi-media monitoring program for the 11 interjurisdictional river reaches was developed by the COWQ. The program, which involves the collection and analysis of water, sediment and biota, was approved by the Board. This monitoring program will be implemented in 1992/93.

The COWQ and the Secretariat prepared PPWB Fact Sheet #6 - Preserving a Prairie Resource: The Agreement on Water Quality. The fact sheet highlights the contents of the new Water Quality Agreement.

The Committee on Water Quality held a Water Quality Trend Assessment Workshop in Winnipeg on December 11-12, 1991. The workshop, which was attended by technical experts from across the country, will be used to help develop a strategy for future trend assessment work.

The Committee agreed to review test studies relating to spatial and temporal variability at monitoring sites and agreed to determine the water quality monitoring frequency required for compliance of the objectives and for predicting water quality trends in interprovincial streams.

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 on page 12 under the heading "Interprovincial Water Quality Contingency Plan".

ANALYTICAL METHODS TASK FORCE

In 1980 The Committee on Water Quality established the Analytical Methods Task Force to determine the comparability of water quality analytical results from Federal and Provincial laboratories on the Prairies.

In October 1991 the Task Force prepared a report entitled "Report on Assessing the Comparability of Water Quality Data Generated by the Federal (IWD) and Provincial Laboratories on the Prairies". This report, along with its recommendations, was approved by the Board in 1991/92. The Analytical Methods Task Force will continue to review data from the quality assurance program and assess laboratory comparability.

The Analytical Methods Task Force, in response to the COWQ's decision to initiate a quality assurance program for multi-media, is discussing the feasibility of PPWB agency laboratories participating in the existing Department of Fisheries and Oceans, Mercury, OC and PCB fish tissue quality assurance program.

The Task Force is also reviewing proposed modifications by NWRI to the Federal/Provincial Quality Assurance Program. The modifications are intended to make the program more cost efficient for participating laboratories.

WATER QUALITY DATA BASE

The Secretariat maintains a computerized up-to-date water quality data base. The PPWB data base, which covers the period 1974 to present, was updated during the year as new results became available from Environment Canada. The Secretariat distributed copies of the data base to member agencies.

MONITORING RESPONSIBILITIES

Since 1974 monitoring has been conducted monthly or quarterly for the PPWB by Environment Canada. The Board uses the monitoring data to determine if the PPWB Water Quality Objectives are being met and to identify interprovincial water quality concerns. The monitoring also provides the information needed to establish baseline characteristics and detect long-term changes in the aquatic environment.

The monitoring locations described below are shown on the Appendix III map at the back of this report.

PPWB MONITORING RIVER REACHES

1. Beaver River - Beaver Crossing to the AB/SK border
2. North Saskatchewan River - Lea Park to Lloydminster ferry
3. Battle River - Blackfoot Creek to Unwin
4. Red Deer River AB/SK - Bindloss to confluence with the South Saskatchewan River
5. South Saskatchewan River - Highway 41 to confluence with the Red Deer River
6. Churchill River - Island Falls to Pukatawagan Lake
7. Saskatchewan River - Outlet of Cumberland Lake to mouth of Carrot River
8. Carrot River - Turnberry to mouth of Carrot River
9. Red Deer River SK/MB - Etomomi River to Red Deer Lake
10. Assiniboine River - Whitesand River to outlet of Shellmouth Reservoir
11. Qu'Appelle River - Kaposvar Creek to the Assiniboine River

In 1991/92 the PPWB reviewed monitoring data for the 97 parameters listed on page 15. This data is used to identify existing or potential water quality concerns at the interprovincial boundaries.

WATER QUALITY OBJECTIVES

The PPWB Water Quality Objectives are used to promote effective interprovincial water quality management, protect uses in downstream jurisdictions, evaluate the quality of interprovincial waters, and advise the Board on potential interprovincial concerns. The parties to the Master Agreement are committed to taking all practical measures to ensure that these objectives are being met.

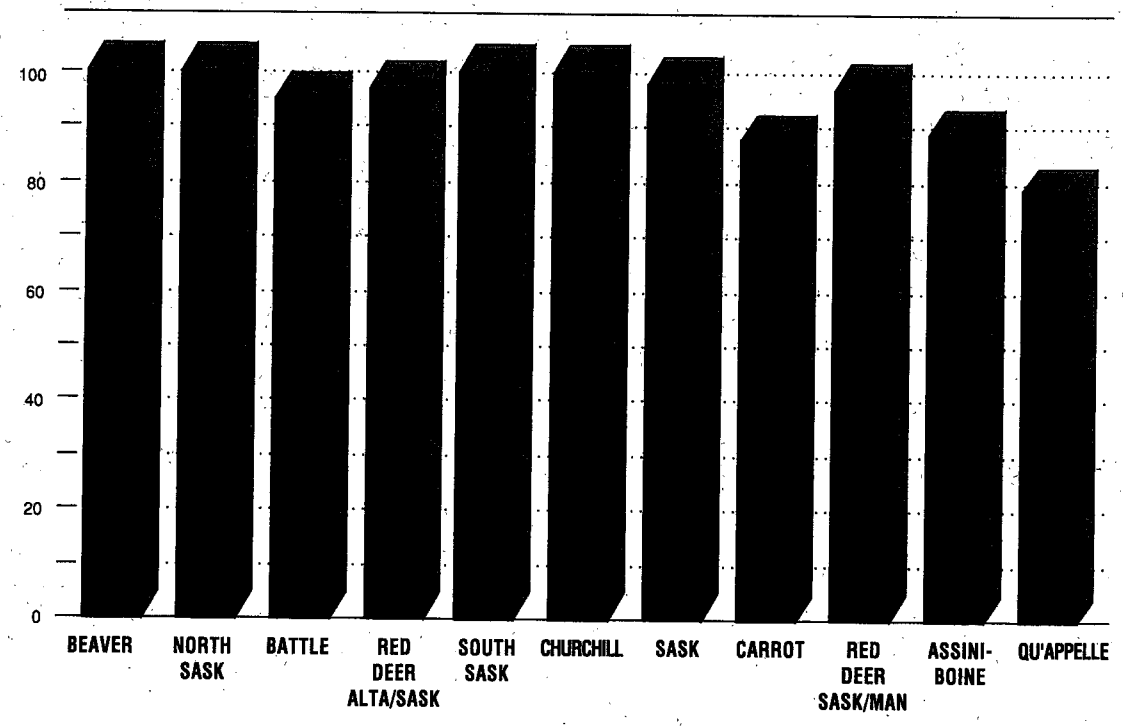
The Committee on Water Quality continually reviews the results of the PPWB Water Quality Monitoring Program and compares the data to the Water Quality Objectives.

A review of water quality data for the PPWB monitoring stations indicated most objectives were met in the 1991 calendar year. The percent adherence to PPWB objectives for all stations in 1991 is shown below. Caution must be taken in comparing 1991 results with last year's, since the monitoring frequency for some constituents has changed.

On average, the PPWB reach specific water quality objectives were adhered to 95 percent of the time. The PPWB stations with the greatest adherence to the objectives were the Churchill River (100 percent), the South Saskatchewan River (100 percent) and the Beaver River (100 percent).

The minimum dissolved oxygen level of 6.0 to 6.5 mg/L during open water was maintained at all PPWB locations. The Qu'Appelle River, the Assiniboine River and the Red Deer River sites at the

1991 PERCENT ADHERENCE TO PPWB OBJECTIVES



Saskatchewan-Manitoba boundary were the only sites, during winter, which periodically showed dissolved oxygen levels below the minimum level of 6.0 mg/L.

Major ion objectives were met 100 percent of the time at most sites. The PPWB objectives for sodium, chloride and sulphate were exceeded a few times in the Qu'Appelle, Carrot, Battle and Saskatchewan Rivers.

The dissolved manganese objective was adhered to 100 percent of the time at most locations where dissolved manganese samples were collected. One exception was the Battle River at the Alberta-Saskatchewan boundary where the dissolved manganese objective was adhered to 83 percent of the time. Total copper was adhered to 100 percent of the time with the exception of the Battle River where the copper objective was adhered to 75 percent of the time. No other trace metal objectives were exceeded.

Relatively high nutrient levels are typical of prairie streams. Adherence to the nitrite plus nitrate and ammonia objectives was 100 percent for all PPWB river reaches. Adherence to the total phosphorus objective (0.05 mg/L as P) ranged from 100 percent on the Churchill River, to 50 percent on the Carrot and Saskatchewan Rivers, to as low as 0 percent on the Qu'Appelle River.

Persistent insecticides such as DDT, Aldrin, Dieldrin, Endrin and Heptachlor were not detected in any PPWB river reach during the year. MCPA and Tordon were detected periodically at some PPWB locations. Atrazine was only detected once at one PPWB site (Assiniboine River near Kamsack).

The herbicide 2,4D was detected at most PPWB sites with the exception of the Churchill River, Beaver River, Red Deer River near Blindloss and the Carrot River. Alpha BHC and Gamma BHC were present in several samples collected at the interprovincial boundaries.

The Board operates a program to investigate the cause of deviations from PPWB objectives and to determine whether downstream water users are at risk. The program was initiated in 1991/92 with two studies in the Assiniboine River basin.

INTERPROVINCIAL WATER QUALITY CONTINGENCY PLAN

In 1991 the PPWB Interprovincial Water Quality Contingency Plan continued to be effective in keeping agencies informed of spills and unusual water quality conditions in prairie streams.

Five spills and unusual water quality conditions were reported to member agencies during the year. The first event, on July 5, 1991, involved an oil spill to the Bow River approximately 30 miles upstream from the confluence of the Oldman River. The spill was a result of a pump jack berm being breached by water from a flash storm. The actual volume of oil that reached the river was minimal. There was no noticeable effect on the quality of the South Saskatchewan River at the Alberta/Saskatchewan boundary.

A second spill occurred on August 17, 1991 when 91 000 litres of primary treated sewage spilled to Marie Creek, a tributary to the Beaver River. The spill was a result of a pump failure at Canadian Forces Airbase, Cold Lake. An above average flow in the Beaver River at the time resulted in no noticeable effect being observed

on the quality of water at the Alberta/Saskatchewan boundary.

A third spill was reported on October 1, 1991. This spill involved 100 000 litres of brine from the ISC-Esterhazy Potash Mine being spilled to Cutarm Creek, approximately five miles upstream from the Qu'Appelle River PPWB monitoring site. Most of the brine was contained within Cutarm Creek basin and the spill had no effect on the water quality of the Qu'Appelle River at the Saskatchewan/ Manitoba boundary.

The fourth event occurred on October 25, 1991, as a result of a valve failure at the A.D. Campbell Hydrostation on the Saskatchewan River at Tobin Lake. Approximately 850 litres of lubricating oil was discharged to the Saskatchewan River. The spill, however, had no noticeable effect on the quality of water at the Saskatchewan/ Manitoba boundary.

The PPWB Contingency Plan was initiated for the fifth time on November 6, 1991 as a result of a water quality control order issued to the City of Edmonton. The control order was in response to past sewer system overflows to the North Saskatchewan River during peak usage times in Edmonton suburbs. The control order asked the City of Edmonton to conduct an evaluation of its sewer system and develop a long-term action plan.

STUDIES

Battle River Study

The PPWB member agencies, with design input from the Committee on Water Quality, initiated a multi-media pilot study on the Battle River in 1989/90. The study involved the documentation of longitudinal and seasonal changes in Battle River quality through the collection of water, sediment and biota samples. This study was undertaken to assess the value of various media in monitoring pesticide and metal concentrations in small prairie streams, and to develop monitoring and analytical protocols for future programs.

Sampling and analysis of sediment and biota continued in 1990/91. A final report entitled, "Multi-Media Monitoring of Trace Metals and Pesticides in the Battle River 1989-1990" was completed in 1991 by Alberta Environment and distributed to PPWB agencies.

Trend Assessment Study

Conducting trend assessments on the 11 major interprovincial streams is an essential component of the PPWB monitoring program. These assessments assist in identifying potential interprovincial water quality concerns. The detection and analysis of long-term trends requires data continuity over time, as well as the application of appropriate trend assessment techniques.

A final report entitled, "Trend Assessment Techniques: Application to Prairie Provinces Water Board Water Quality Data Set - March 1991" was prepared for the Board by Dr. El-Shaarawi and Dr. Esterby of the National Water Research Institute. The report identifies appropriate trend assessment procedures to be used at PPWB monitoring stations and documents the initial results of trend analysis at 11 PPWB monitoring sites. Further work to confirm positive and negative trends in water quality at PPWB sites will be carried out in 1992/93.

Assiniboine River/Shellmouth Reservoir Studies

In 1991/92 Saskatchewan Environment and Public Safety, in cooperation with Environment

Canada and the PPWB agreed to undertake a pilot study to assist in determining the cause and significance of excursions to the PPWB objectives on the Assiniboine River near the Saskatchewan/Manitoba boundary. Samples were collected in 1991/92 to determine whether past excursions to the dissolved oxygen, sodium, total phosphorus and manganese objectives were a result of effluent discharges from the Kamsack sewage lagoon. Data analysis is underway and a report on the study results is expected in the 1992/93 fiscal year.

Manitoba Environment, Saskatchewan Environment and Public Safety, Environment Canada and the PPWB undertook a study to determine nutrient loadings to Shellmouth Reservoir and to ascertain the nutrient monitoring frequency required at the PPWB site to predict accurate nutrient loadings to Shellmouth Reservoir. Manitoba Environment collected nutrient samples in the spring of 1991 and throughout the remainder of the year. A report should be available in 1992/93.

SECRETARIAT ACTIVITIES

In addition to the activities previously described for 1991/92, the Secretariat:

- prepared, with the assistance of the Committee on Water Quality, a Water Quality Procedures Manual. The manual outlines the Board's responsibility and activities in the area of water quality and defines the PPWB reach specific water quality objectives;
- updated the PPWB Water Quality Contingency Plan;
- conducted statistical analysis on water quality in Battle Creek to assist PFRA in preparing an EIS on the proposed Battle Creek Dam;
- conducted initial statistics and trend analysis on four PPWB sites to determine the effects of monitoring frequency on trend assessment predictions;
- converted NWRI mainframe water quality trend assessment programs to operate on the Secretariat's micro computers;
- prepared a News Release and Background Document on the new PPWB Water Quality Agreement;
- prepared the proceedings of the Water Quality Trend Assessment Workshop held in Winnipeg on December 11-12, 1991.

PPWB Water Quality Monitoring 1991 Parameter List

Aldrin
Alkalinity, phenol.
Alkalinity, total
Aluminum, dissolved
Aluminum, ext.
Arsenic, diss.
Atrazine
Barban
Barium, total
BHC-alpha
BHC-gamma (Lindane)
Bicarbonate, calc.
Bronoxynil
Cadmium, total
Calcium, diss.
Carbon, diss., organic
Carbon, organic, particulate
Carbonate, calc.
Chlordane-alpha
Chlordane-gamma
Chloride, diss.
Chlorophyll A
Chromium, total
Cobalt, total
Coliforms, fecal
Coliforms, total
Color, true
Copper, total
Cyanide, total
P,P-DDD
P,P-DDE
O,P-DDT
P,P-DDT
Diallate
Dicamba
Diclofopmethyl
Dieldrin
Endevan
Endosulfan-alpha
Endosulfan-beta
Endrin
Fluoride, diss.
Free CO_2
Hardness, non-carbonate
Hardness, total, $CaCO_3$
Heptachlor
Heptachlor, expoxide
Hexachloro-benzene
Hydroxide, calc.
Iron, diss.
Lead, total
Manganese, diss.
Magnesium, diss.
MCPA
MCPB
Mercury, total
P,P-methoxychlor
Mirex
Nickel, total
Nitrogen, diss., NO_3+NO_2
Nitrogen, particulate
Nitrogen, total Ammonia
Nitrogen, total, calc.
Nitrogen, total, diss.
Oxygen, diss., DO
PCB, Arochlor 1242
■ PCB, Arochlor 1254
■ PCB, Arochlor 1260
■ PCB, Arochlor total
pH
Phosphorus Ortho as P
Phosphorus, part. calc.
Phosphorus, total, diss.
Phosphorus, total as P
● Picloram (Tordon)
Potassium, diss.
Residue, fixed, non-filterable
Residue, non-filterable
Selenium, diss.
Silica, reactive
Silvex
Sodium, percent
Sodium, diss.
Solids, total diss., calc.
Specific conductance
Sulphate, diss.
Temperature
Triallate
Trifluralin
Turbidity
Vanadium, total
Zinc, total
2,3,6-TBA
2,4-D
2,4-DB
2,4-DP
2,4,5-T

● Collected at five sites only
■ Reported only if detected

1991 Flow Data

1992

RECORDED AND NATURAL FLOWS, CONSUMPTIVE USE, DIVERSION, AND STORAGE (in Cubic Decametres) FOR THE 1991 APPORTIONMENT PERIOD

SOUTH SASKATCHEWAN RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	199 000	290 000	334 000	327 000	790 000	1 470 000	1 550 000	623 000	286 000	217 000	270 000	225 000	6 581 000
COMSUMPTIVE USE	1240	1450	1310	123 280	237 340	364 020	292 180	268 130	210 690	61 230	1090	1580	1 563 540
CHANGE IN STORAGE	-55 570	-62 210	-72 520	-18 990	379 100	320 520	62 440	-165 900	-100 090	-67 750	-53 360	-63 450	102 220
DIVERSION FROM BASIN	0	0	0	2280	18 980	37 210	37 910	40 980	23 500	15 180	0	0	176 040
NATURAL FLOW ALTA.BDY.	158 910	215 070	256 690	359 560	1 418 700	2 207 000	1 957 090	796 820	396 080	265 650	216 070	163 080	8 410 720

RED DEER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

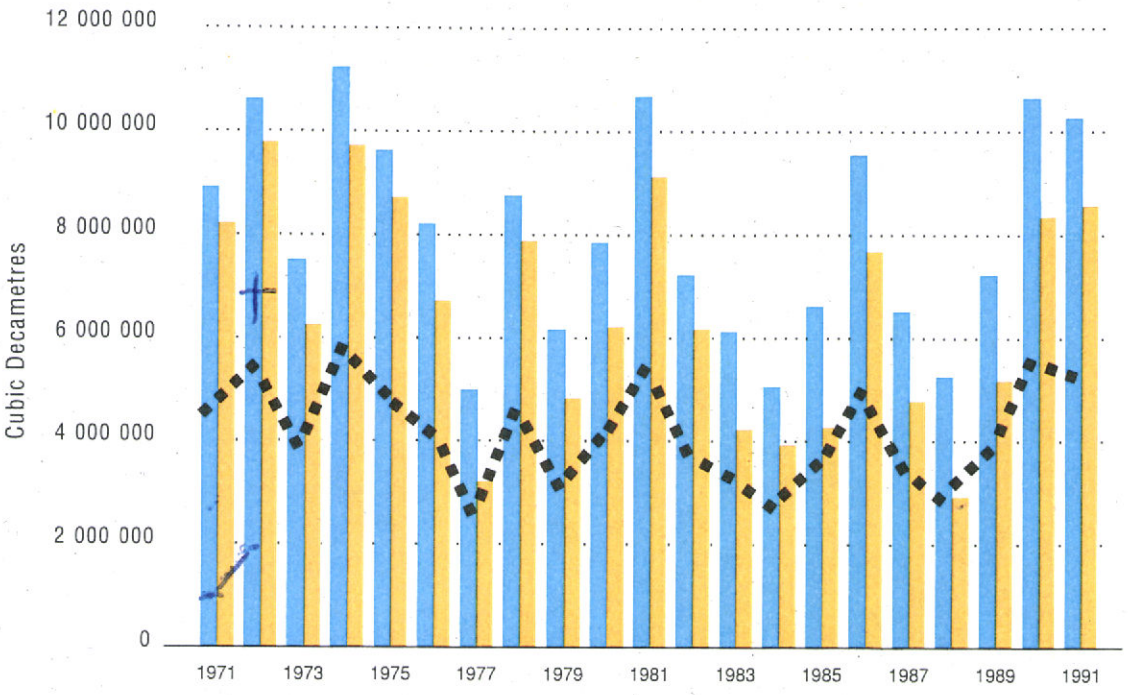
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	36 100	53 300	75 800	211 000	180 000	322 000	473 000	244 000	122 000	94 100	80 800	58 300	1 950 400
COMSUMPTIVE USE	0	0	0	3010	4650	4550	5610	3240	2790	-20	0	0	23 830
CHANGE IN STORAGE	-27 880	-16 870	-16 270	-570	36 130	38 900	10 470	19 020	13 620	-3810	-19 390	-28 010	5340
DIVERSION INTO BASIN	0	0	0	-2280	-18 980	-37 210	-37 910	-40 980	-23 500	-15 180	0	0	-176 040
NATURAL FLOW ALTA.BDY.	7670	35 070	56 420	208 840	196 690	331 700	454 270	223 980	115 220	79 940	63 470	29 580	1 802 850

SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER

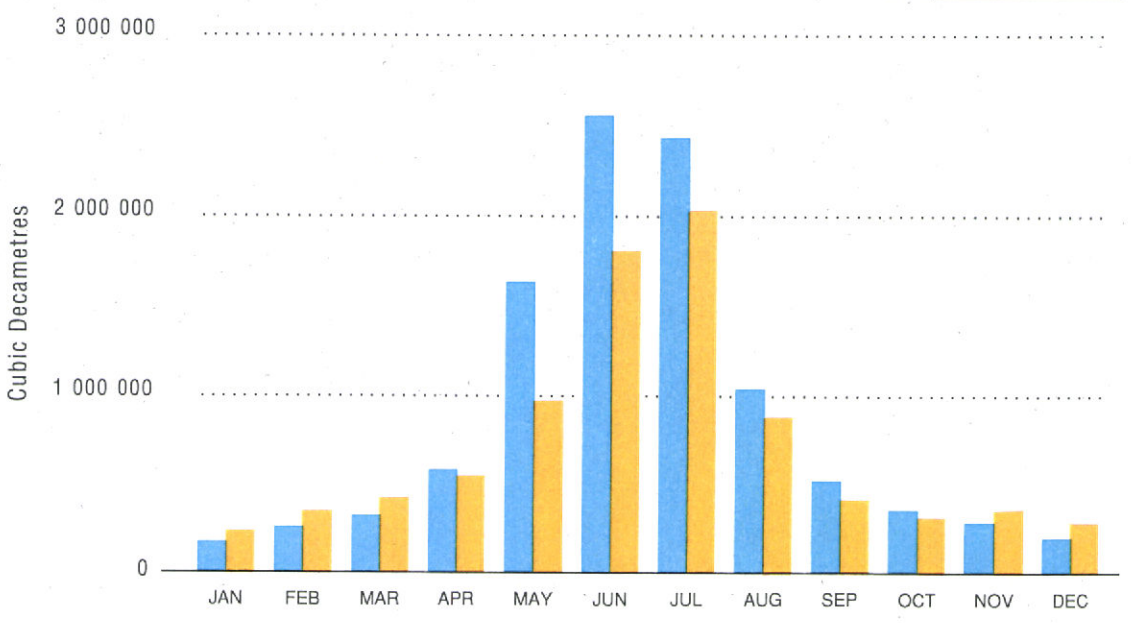
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	235 000	344 000	410 000	538 000	969 000	1 789 000	2 019 000	867 000	408 000	311 000	350 000	284 000	8 524 000
NATURAL FLOW	167 000	250 000	313 000	568 000	1 615 000	2 539 000	2 411 000	1 021 000	511 000	346 000	280 000	193 000	10 214 000

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)



1991 MONTHLY FLOWS OF THE SOUTH SASKATCHEWAN RIVER NEAR ALBERTA — SASKATCHEWAN BOUNDARY (INCLUDES RED DEER RIVER)



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RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THE ALBERTA-SASKATCHEWAN BOUNDARY (in Cubic Decametres) FOR THE 1991 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	274 000	304 000	385 000	925 000	1 060 000	1 230 000	1 520 000	906 000	630 000	417 000	370 000	342 000	8 363 000
NATURAL FLOW	71 200	80 400	115 000	709 000	1 070 000	1 560 000	1 970 000	1 330 000	731 000	373 000	205 000	108 000	8 322 600

BATTLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	80	533	1165	2770	849	704	465	323	414	-	-	7303
NATURAL FLOW	-	80	341	1213	2786	861	775	497	332	414	-	-	7299

LODGE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	-	1125	1353	4448	965	1004	39	2	10	-	-	8946
NATURAL FLOW	-	3	1880	1524	5198	1054	1021	13	9	1	-	-	10 703

MIDDLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	1	183	369	1809	147	96	41	29	26	-	-	2701
NATURAL FLOW	-	1	250	475	2189	192	158	9	26	5	-	-	3305

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

RECORDED FLOW	3450	2800	3690	25 900	16 200	29 900	32 000	7810	3220	2650	1890	2130	131 640

BATTLE RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	1540	2000	3690	39 500	53 700	34 700	33 900	25 300	18 500	11 000	5460	4670	233 960

APPENDIX I

STATEMENT OF EXPENDITURES AND FINAL CLAIM

PRAIRIE PROVINCES WATER BOARD
STATEMENT OF EXPENDITURES AND FINAL CLAIM

FINANCIAL YEAR 1991/92

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 91/92	EXPENDITURES
Salaries:		
(01) Permanent Staff	$267,000	$248,000
(02) Temporary Staff	0	16,843
(03) Overtime/Other Pay	0	2,517
TOTAL SALARIES	$267,00	$267,360
O & M:		
(07) Travel	$ 17,700	$ 14,128
(09) Postage	1,000	1,667
(10) Telecommunications	6,100	6,157
(15) Printing	12,400	16,287
(18) Profess. Services	32,300	26,681
(19) Training	3,000	479
(20) Temporary Help	3,500	1,497
(21) Personal Services	32,300	32,195
(22) Other Services	8,700	5,862
(25) Rentals	37,600	36,400
(28) Equipment Repair	3,000	725
(33) Purchased Materials	6,000	3,704
(35) Parts & Consumables	2,000	6,354
(41) Equipment Acquisition	3,600	6,707
TOTAL O & M	$168,900	$158,843
TOTAL SALARIES AND O & M	$435,900	$426,203
FRINGE BENEFITS *	$ 24,500	$ 22,320
TOTAL EXPENDITURES	$460,400	$448,523
less overclaim		- 1,213
		$447,310

** Nine percent of Permanent Salaries*

Each province's share (one-sixth of the total amount of $447,310) is $74,552.

FINAL CLAIM **$ 74,552**

APPENDIX II

BOARD/COMMITTEE MEMBERSHIP

PPWB MEMBERS

CHAIRMAN	D.L. Egar (Jan/92)	Director General Ecosystem Sciences and Evaluation Directorate Conservation and Protection Environment Canada
	D.A. Davis (Mar/90 - Dec/91)	Director General Inland Waters 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 Environment
	W.L. Dybvig (Feb/92)	Vice President Water Management Division Saskatchewan Water Corporation
	D.L. MacLeod (Dec/84 - Oct/91)	Vice President Water Management Division Saskatchewan Water Corporation
	L.J. Whitney	Executive Director 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 Environment
Vacant	Saskatchewan Water Corporation
W.L. Dybvig (Aug/88 - (Feb/92)	Vice President Water Management Division Saskatchewan Water Corporation
Vacant	Manitoba Natural Resources
V.M. Austford (Jan/90 - Feb/92)	Deputy Director Water Resources Branch 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 Environment
	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 Environment
	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.

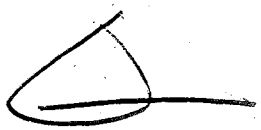
Responsibilities of the Committee will include: exchange of information; compilation and interpretation of existing data; recommendations on groundwater information and monitoring requirements; determination of implications of proposed projects which may impact the quantity and/or quality of waters at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

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

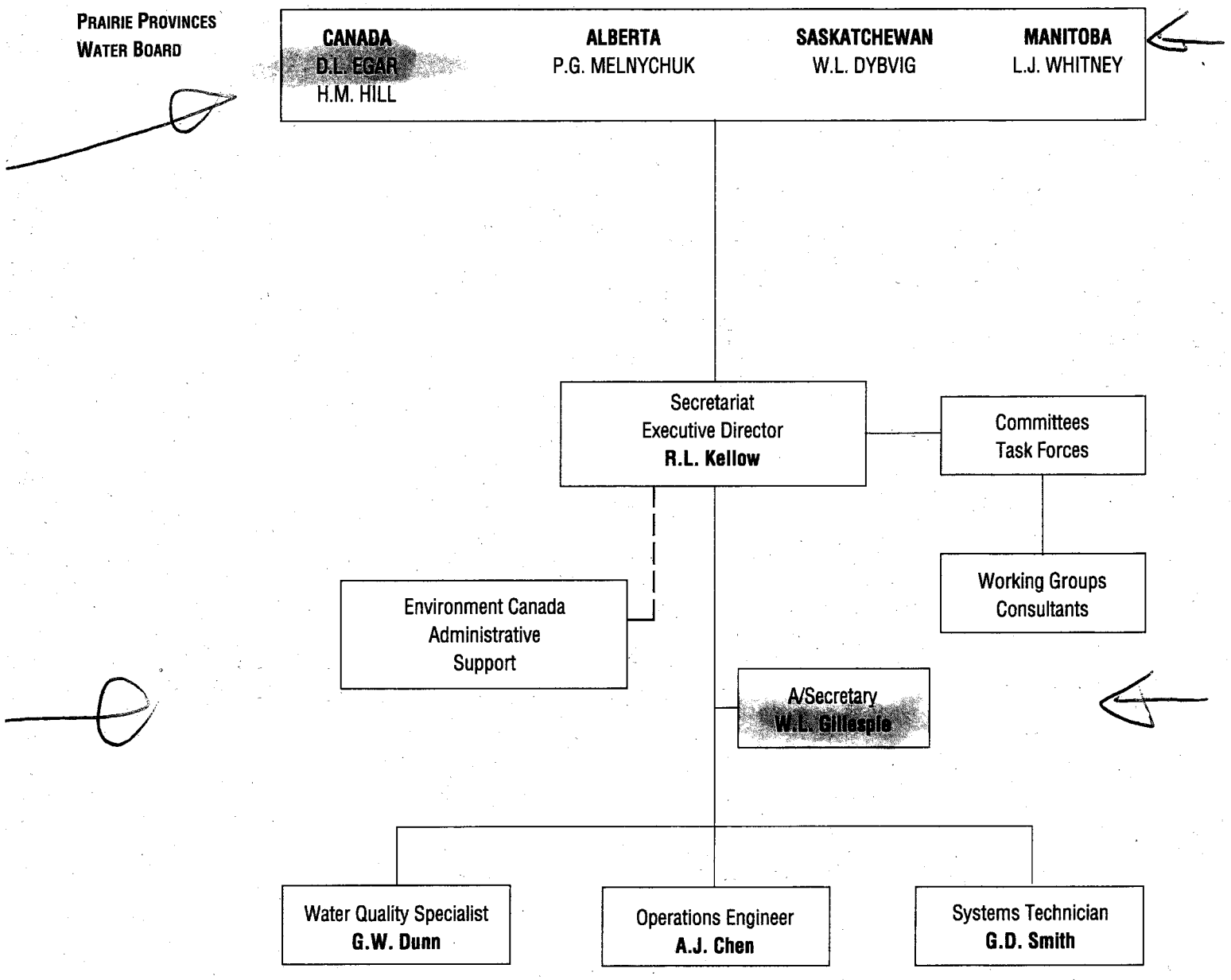
MEMBERS

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	Groundwater Protection Branch Alberta Environment
	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

(MAY 80 – DEC 92)



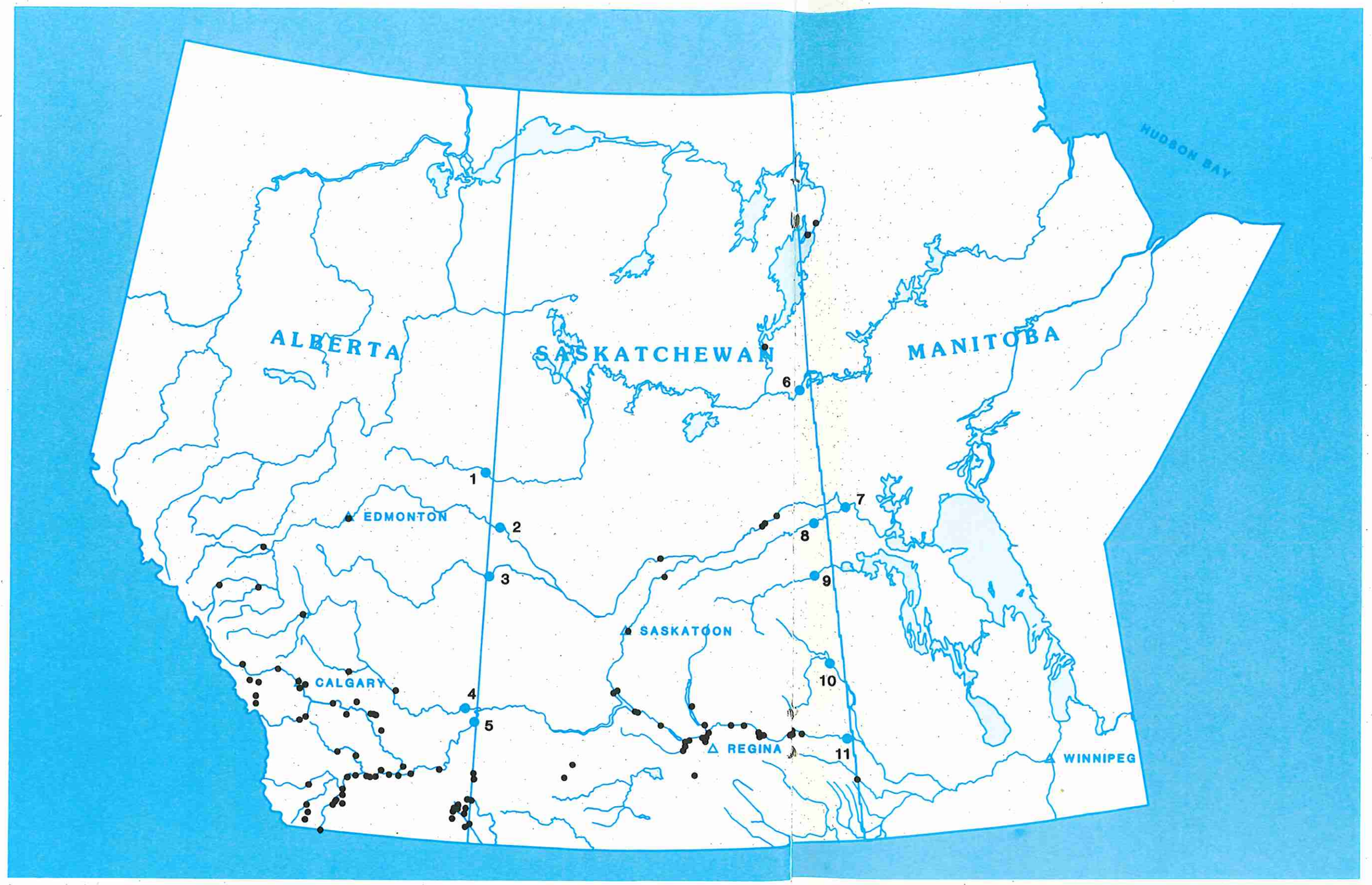
ORGANIZATIONAL CHART



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

Recycled Paper