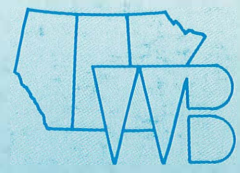
ANNUAL REPORT · 1990

CANADA · ALBERTA · SASKATCHEWAN · MANITOBA

PRAIRIE PROVINCES WATER BOARD



PRAIRIE PROVINCES WATER BOARD

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ANNUAL REPORT

FOR THE YEAR ENDING MARCH 31, 1991

ISSN 0704-8726

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LETTER OF TRANSMITTAL

September 4, 1991

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

Honourable Ralph Klein
Minister of Environment
Edmonton, Alberta

Honourable Bill McKnight
Minister of Agriculture
Ottawa, Ontario

Honourable Harold Martens
Minister Responsible for
Saskatchewan Water Corporation
Regina, Saskatchewan

Honourable Harry J. Enns
Manitoba 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, 1991.

Yours truly,

D.A. Davis

D.A. Davis, Chairman

MESSAGE FROM THE EXECUTIVE DIRECTOR

For the Prairie Provinces Water Board, 1990/91 was a most satisfying period of project completion and progress. This is particularly true concerning the Board's water quality work. I look forward to seeing the results of new water quality objectives, a redesigned monitoring program and the Board's effort to more clearly define the PPWB's role in interprovincial water quality matters.

Although interprovincial water quality management has been within the mandate of the Prairie Provinces Water Board since 1969, the *Master Agreement on Apportionment* does not provide specific terms for carrying out this activity. In recognition of this and the growing importance of water quality in the prairies, the Board began working on an amendment to the Master Agreement to better frame the PPWB's water quality role and responsibilities.

New reach specific water quality objectives were used for the first time this year. They replace the 1973 Water Quality Objectives, and more accurately reflect the characteristics and uses of each interprovincial stream currently monitored by the PPWB. Water quality on interprovincial streams continues to be good, with 96 percent adherence to the objectives.

Water apportionment conditions were fully met on all interprovincial streams. On the South Saskatchewan River, Alberta delivered 82 percent of the total annual natural flow and met the minimum flow requirement at all times. At Lodge and Middle Creeks the Board increased its monitoring from three to eight times per year. This helped Alberta fulfil its apportionment obligations despite another dry year in these basins.

During the year the Committee on Groundwater completed a review of groundwater related legislation. The Committee concluded legislation exists in all three provinces to address most groundwater issues, and made several recommendations to improve interprovincial groundwater management. The Board will consider these recommendations in the next fiscal year.

In August the Board published an update of a major report -- "Historic and Current Water Uses in the Saskatchewan-Nelson Basin". The update provides the latest available information on population trends and water use for municipal, industrial, power and agricultural purposes.

To promote greater public understanding of the PPWB's role and activities, the Board produced a new brochure, a series of fact sheets and a display. I appreciated Board and committee members' input in the successful undertaking of these and other projects this year.

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, 1990, to March 31, 1991.

The Board met twice during 1990/91; October 2-3, 1990, in Winnipeg, Manitoba; and March 19, 1991, in Regina, Saskatchewan.

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

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 1990/91, 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.

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 1990/91 the Committee on Hydrology reviewed the hydrometric network to ensure changing use patterns were appropriately monitored to allow computation of natural flow. As of March 31, 1991, 112 stations were required for computational purposes. These are plotted on the map at the end of this report.

The Committee also confirmed the continuing need for 17 Atmospheric Environment Service (AES), Environment Canada, meteorological monitoring stations in the three prairie provinces. As with the other sites, these provide information for computing natural flow at the interprovincial boundaries.

At its March 1991 meeting, the Board approved the 1991/92 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 8 694 000 cubic decametres (dam^3) in the South Saskatchewan River, at the point below its junction with the Red Deer River, represented 82 percent of the total annual natural flow of 10 571 000 dam^3. A summary of recorded and natural flow volumes for 1990 at this apportionment point is shown in table and graph form on pages 16 and 17.

From January 1 to December 31, 1990, 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, 1990, and March 31, 1991, was 82 169 dam^3. Recorded flow, augmented by releases of 163 490 dam^3 from Lake Diefenbaker, was 160 010 dam^3. Recorded and natural flows covering April 1990, to March 1991, are shown on page 18.

A COH suggestion prompted Environment Canada, Water Resources Branch, Regina, to increase the frequency of reporting apportionment balance for Lodge and Middle Creeks. The change was from three times a year to a monthly basis throughout the open water period of 1990. 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 19.

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 18 and 19.

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, 1990, to March 31, 1991, the recorded flow on the Pipestone at the boundary was 7048 dam^3, compared to a natural flow of 8809 dam^3 - an excess flow of 2643 dam^3.

COMMITTEE ON HYDROLOGY

The Committee on Hydrology met twice during the year: on October 5-6, 1990, in Winnipeg, Manitoba; and on February 27, 1991, in Regina, Saskatchewan.

During these meetings the Committee discussed and approved a report prepared by Saskatchewan Water Corporation entitled "Qu'Appelle River SSARR Model Modification Study". The COH agreed, for the purposes of preparing the annual apportionment report, Environment Canada, Atmospheric Environment Service should supply the Water Resources Branch, Regina, with the additional information needed to compute gross evaporation for the Qu'Appelle River SSARR Model. The Committee further decided that Sask Water, in transferring the model to the Water Resources Branch, should provide a report outlining the procedures and data required to operate the model.

In October, the Committee reviewed a draft report entitled "Pipestone Creek at the Saskatchewan-Manitoba Boundary Natural Flow Study". The report will be finalized in 1991-92 to reflect comments suggested by the COH.
The Committee also reviewed the monitoring requirement for the Battle Creek Basin. Two decisions were made: to continue operating the hydrometric station "Battle Creek at Alberta Boundary (11AB117)", and to reduce the natural flow computation for Battle Creek at Alberta-Saskatchewan boundary from three times to once a year until more frequent apportionment is required.

Another topic of discussion was the hydrometric gauging station "Pipestone Creek above Moosomin Reservoir (05NE003)", which has been a temporary station since 1986. Flow records of this station are used by the Secretariat for apportionment purposes to compute monthly natural flow of Pipestone Creek at the Saskatchewan-Manitoba boundary. The COH agreed this station should be upgraded to a permanent station if flow measurement is not a problem.

Regarding a concern raised by Alberta Environment about possible pumping activities in the Saskatchewan portion of the Lodge Creek Basin, the Committee agreed to organize a

field trip to the basin in April 1991 to view the project site. With the Saskatchewan Luck Lake irrigation project now in operation, the Committee agreed to include the project in the apportionment monitoring of the Saskatchewan River Basin starting in the 1990/91 apportionment period.

As requested by the COH in November 1990, the Canada Water Resources Branch, Winnipeg, completed the Red River natural flow study report. The Branch provided the Secretariat with natural flow data of Red River at Emerson for the years 1974 to 1988 inclusive.

COMMITTEE ON GROUNDWATER

The Committee met four times during the year: on April 17, 1990, in Calgary, Alberta; on September 12-13, 1990, in Regina, Saskatchewan; on December 4, 1990, in Winnipeg, Manitoba; and on February 5-6, 1991, in Edmonton, Alberta.

The main purpose of these meetings was to finalize the report "An Evaluation of Existing Groundwater Legislation in the Prairie Provinces". The report documents existing provincial groundwater legislation and makes recommendations concerning interprovincial groundwater management.

As requested by the Saskatchewan Water Corporation, the Committee reviewed the groundwater component of the "Qu'Appelle River SSARR Model Modification Study". Generally, the report's estimate of groundwater contribution to the Qu'Appelle River system was thought to be high. However, the COG agreed other methods for estimating groundwater inflow would be costly and subject to a fair degree of error.

Following the completion of two National Hydrology Research Institute (NHRI) reports dealing with groundwater quality in Alberta and Saskatchewan, the Committee recommended to the NHRI that a similar report for Manitoba be prepared.

ANNUAL WATER USE REPORT - BOXELDER CREEK BASIN

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 1990 was 186 dam^3. During the same period, the four provincial reservoirs stored 518 dam^3 and released 529 dam^3 to the Boxelder Creek system. Based on the responses of the 1990 water use survey, conducted by the Saskatchewan Water Corporation, 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 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 1990 Saskatchewan licensed 30 new drainage projects with potential interprovincial implications. Manitoba and Alberta both reported no projects with the potential to affect streams crossing interprovincial boundaries.

STUDIES

Provincial Legislation Related to Groundwater

The Committee on Groundwater reviewed existing groundwater legislation, regulations and policies to determine how they deal with potential inter-provincial problems related to allocation and contamination. The report, "An Evaluation of Existing Groundwater Legislation in the Prairie Provinces", was completed and submitted to the Board in March 1991.

Natural Flow Studies on Small Interprovincial Basins

In 1975, the Board requested the Secretariat 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 stations is carried out on a continuing basis.

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

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.

In April, 1989, the Board signed a contract with the Saskatchewan Water Corporation to undertake a natural flow study of Pipestone Creek. A draft of the report was reviewed by the COH in October, 1990. The study is expected to be completed in fiscal year 1991/92.

Irrigation Return Flow Studies

Since 1986, a field program has been conducted by Environment Canada, Water Resources Branch, Calgary, to gather irrigation return flow data in the Eastern, Western and Bow River Irrigation Districts. Data are to be used in developing new return flow equations.

The Committee on Hydrology reviewed a report on the results of that program. This report and the document "Return Flow From Irrigation - Southern Alberta" (October 1985) were combined into the handbook

"Return Flow From Irrigation Districts In South Saskatchewan River Basin" (September 1989).

Design Wind Data Study

Further work on the Design Wind Data Study (Phase II, part B) was completed in January 1991 by Environment Canada, Atmospheric Environment Service, Regina. The study includes modifying existing software and documenting computer procedures needed for plotting wind rose diagrams. Wind rose diagrams are required for assessment of shoreline flooding, dam design and shoreline erosion.

Qu'Appelle River SSARR Modification

Due to inaccuracies in the current Qu'Appelle River natural flow SSARR model, the COH recommended the existing model be modified to improve its accuracy and make it operational on a personal computer. Subsequently in 1989, the Board entered into a contract with the Saskatchewan Water Corporation to recalibrate the SSARR model. The final report was reviewed and approved by the COH in February 1991.

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 database containing six sectors: regional economic base, municipal and industrial, agriculture, power generation, recreation and environmental considerations.

During 1990/91 the PPWB completed an update of the database to 1986. This update provides information on population trends, as well as water use data for municipal, industrial, power and agricultural purposes.

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 1990/91, the Secretariat developed natural flow computation computer programs for the Assiniboine River, Battle River, Big Gully Creek, Gainsborough Creek and Graham Creek. The Secretariat also updated the monthly natural flows of these streams to 1986.

Access to AES Meteorological Data

The Secretariat annually acquires computer tapes from AES containing historical meteorologic records of the prairie provinces. As of March 1991, the tapes provide information to 1989.

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

WATER QUALITY

COMMITTEE ON WATER QUALITY

The Committee on Water Quality met on May 15-16, 1990, in Edmonton, Alberta and by conference call on November 29, 1990.

During the meetings the Committee agreed to contract the National Water Research Institute (NWRI) to review trend assessment techniques and apply trend analysis to data from the 11 PPWB monitoring sites. The COWQ reviewed the draft report and provided NWRI with comments.

The Committee made minor modifications to the PPWB reach specific water quality objectives by incorporating

information from the South Saskatchewan River Basin Study. The Board approved the new objectives.

A multi-media monitoring program for the 11 inter-jurisdictional river reaches was developed by the COWQ. This program, which involves the collection and analysis of water, sediment and biota, was accepted by the Board. The program will be implemented in 1991/92 if funds are available.

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 11 under "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 used by PPWB agencies.

During 1990/91 this task force prepared a draft report on the results of data collected from 1985 to 1990 under the quality assurance program. "Report on Assessing the Comparability of Water Quality Data Generated by the Federal (IWD) and Provincial Laboratories on the Prairies" was reviewed by the COWQ and will be forwarded to the Board in 1991/92.

The Analytical Methods Task Force will continue to review data from the quality assurance program and assess laboratory comparability.

WATER QUALITY DATABASE

The Secretariat maintains a computerized historical water quality database. The PPWB database, which covers the period 1974 to present, was updated during the year as new information became available. The Secretariat distributed copies to member agencies for their use.

MONITORING RESPONSIBILITIES

Since 1974 monitoring has been conducted monthly or quarterly for PPWB by Environment Canada. The Board uses the monitoring data to determine if the PPWB Water Quality Objectives are being met. 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.

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 1990/91 the PPWB reviewed monitoring data for the 95 parameters listed on page 14. This served 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 have been committed to taking all practical measures to ensure these objectives are met.

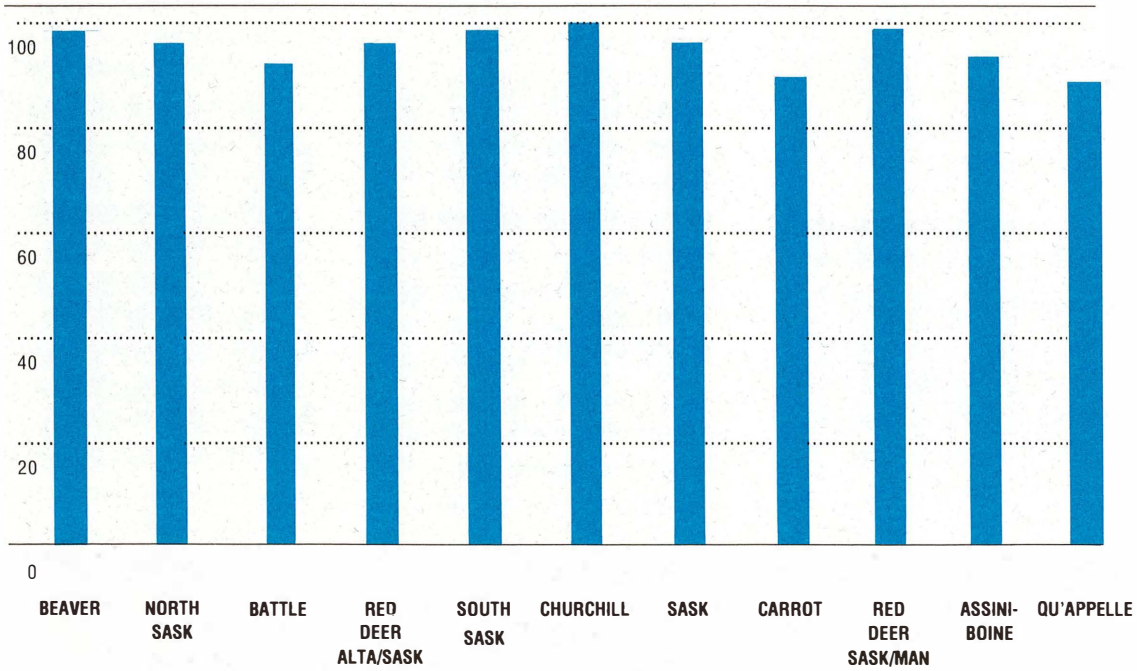
The Committee on Water Quality continually reviews the results of the PPWB water quality monitoring program and compares the data to the Water Quality Objectives.

A review of water quality data for the PPWB monitoring stations indicated most objectives were met in the 1990 calendar year. The percent adherence to PPWB objectives for all stations in 1990 is shown below.

On average, the PPWB reach specific water quality objectives were adhered to 96 percent of the time. The PPWB stations with the greatest adherence to the objectives were the Churchill River (100 percent), the South Saskatchewan River (99 percent), the Red Deer River crossing the Saskatchewan-Manitoba boundary (99 percent) and the Beaver River (99 percent).

The minimum dissolved oxygen level of 6.0 to 6.5 mg/L during open water was maintained at all PPWB locations. The Assiniboine River at the

1990 PERCENT ADHERENCE TO PPWB OBJECTIVES



Saskatchewan-Manitoba boundary was the only site which periodically during winter 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 only exceeded a few times in the Qu'Appelle, Carrot and Assiniboine Rivers.

Dissolved manganese was adhered to 100 percent of the time at most locations. Two notable exceptions were the Qu'Appelle River near Welby (50 percent) and the Assiniboine River at Kamsack (60 percent). A third exception was the Beaver River near the Alberta-Saskatchewan boundary (55 percent). Other trace metal objectives for chromium, copper, lead, zinc and iron were adhered to most of the time.

Relatively high nutrient levels are typical of prairie streams. Consequently, while adherence to the nitrite plus nitrate objective 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 25 percent on the Assiniboine River, to 14 percent on the Carrot River, to as low as 0 percent on the Qu'Appelle River.

Persistent insecticides such as DDT, Aldrin, Dieldrin, Endrin and Heptachlor were seldom present, if at all, in any PPWB river reach during the year. MCPA was detected periodically at some PPWB locations.

The herbicide 2,4D was detected at most PPWB sites, with the exception of the Churchill River and the Red Deer River at the Saskatchewan-Manitoba boundary. Alpha BHC and Gama BHC were present in many of the same samples collected at the interprovincial boundaries. Picloram and Atrazine were seldom detected at any of the PPWB monitoring sites.

During the year the Board established a program to investigate the cause of deviations from PPWB objectives and to determine whether downstream water users are at risk. This program will be initiated in 1991/92 with studies on the Assiniboine River.

INTERPROVINCIAL WATER QUALITY CONTINGENCY PLAN

In 1990 the PPWB Interprovincial Water Quality Contingency Plan continued to be effective in keeping agencies informed of spills and unusual water quality conditions in the prairie streams.

Four spills and unusual water quality conditions were reported to member agencies during the year. Two of these occurred on the North Saskatchewan River system.

The first spill happened on July 2-3, 1990, when approximately 35 000 m^3 of untreated sewage was released to the North Saskatchewan River at Edmonton due to a sewage system overflow during heavy storms. The spill was not a concern because the river flow of 10 times normal provided a high amount of dilution.

A second release to the North Saskatchewan River occurred on September 2-3, 1990, when approximately 7000 m^3 of high pH effluent from the Petro-Canada refinery was spilled. Water quality samples were collected by Alberta Environment. They showed the spill had no effect on water quality in the

North Saskatchewan River at the interprovincial boundary.

One unusual water quality condition was reported in the South Saskatchewan River at Medicine Hat on May 3, 1990. A sediment sample taken from the treatment plant intake revealed mercury sediment concentrations of as high as 200 ppb. However, Alberta Environment follow-up sampling revealed background elemental mercury concentrations of 20 ppb above and below the location. The elevated intake levels may have resulted from increased bacteria in the sediments due to backflushing of the city intakes.

Small zones of high elemental mercury in sediments are not an environmental concern. They do not effect the concentrations of mercury crossing the interprovincial boundary.

Low dissolved oxygen levels of 0.0 mg/L and 3.3 mg/L in the Carrot and Assiniboine Rivers respectively were reported on February 19-20, 1991. Since historical dissolved oxygen concentrations during February are at or near these levels, no concerns were identified.

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 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 draft report of the study was prepared during the year for review by PPWB agencies. A final report will be completed next fiscal year.

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 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.

In 1990/91 the Board contracted the National Water Research Institute to identify the appropriate trend assessment procedures to be used at each PPWB monitoring station. A report documenting the results of the trend analysis at all 11 monitoring sites was completed in March 1991.

Further work to determine the cause of positive and negative trends in water quality will be carried out next fiscal year. Also, trend assessment computer programs at the Canadian Centre for Inland Waters (CCIW) will be converted to operate on the Secretariat's microcomputer.

SECRETARIAT ACTIVITIES

In addition to the activities previously described for 1990/91, the Secretariat:

- prepared, with the assistance of the Committee on Water Quality, a draft Water Quality Procedures Document. It outlines the Board's responsibilities and activities in the area of water quality, and defines the procedures for carrying out the monitoring program and developing the PPWB Water Quality Objectives.

- prepared fact sheets on the PPWB Water Quality Objectives and Water Quality Contingency Plan.

- conducted a seminar on trend assessment techniques.

PPWB Water Quality Monitoring 1990 Parameter List

Aldrin
Alkalinity, phenol.
Alkalinity, total
Aluminum, dissolved
Aluminum, ext.
Arsenic, diss.
Atrazine
Barban
Barium, total
BHC-alpha
BHC-gamma (Lindane)
Bicarbonate, calc.
Boron, diss.
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 as N
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

1990 Flow Data

RECORDED AND NATURAL FLOWS, CONSUMPTIVE USE, DIVERSION, AND STORAGE (in Cubic Decametres) FOR THE 1990 APPORTIONMENT PERIOD

SOUTH SASKATCHEWAN RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	262 000	181 000	351 000	406 000	816 000	2 030 000	708 000	382 000	127 000	207 000	298 00	155 000	5 923 000
COMSUMPTIVE USE	1 460	1 790	4 100	57 490	252 390	283 830	541 870	395 680	324 070	63 070	1 960	2 040	1 929 750
CHANGE IN STORAGE	-62 930	-84 040	-86 450	-50 040	81 260	253 080	131 930	-38 330	-99 730	-10 700	-28 590	-57 880	-52 420
DIVERSION FROM BASIN	0	0	0	3 160	18 250	30 030	40 820	32 220	19 740	12 510	0	0	156 730
NATURAL FLOW ALTA.BDY.	193 910	109 750	269 270	381 540	1 125 180	2 568 000	1 444 220	791 610	375 460	320 470	277 170	107150	7 963 730

RED DEER RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

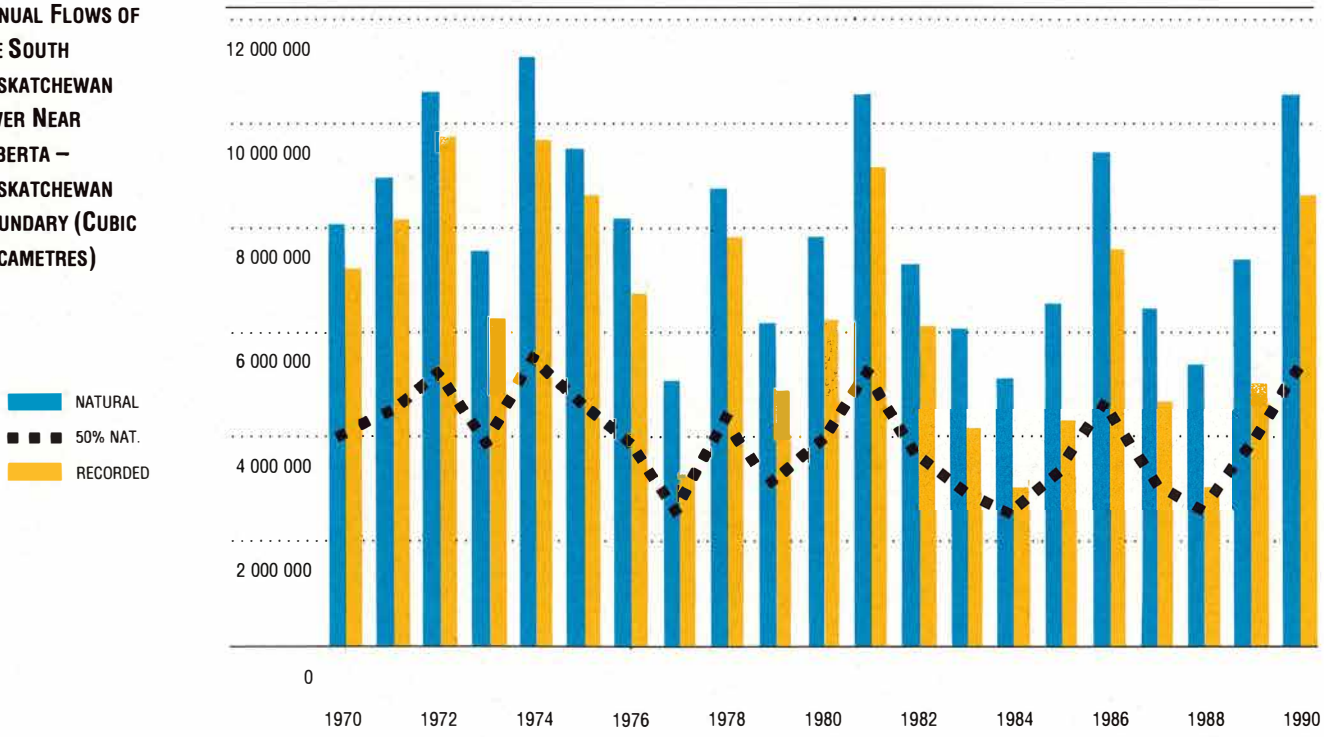
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	46 600	34 700	115 000	307 000	229 000	946 000	584 000	229 000	119 000	76 900	36 800	45 600	2 769 600
COMSUPTIVE USE	0	0	0	2 930	4 130	2 230	5 070	6 180	2 790	440	0	0	23 770
CHANGE IN STORAGE	-21 950	-21 830	-3 970	-33 630	62 850	4 330	4 970	-1 260	1 860	8 880	-7 800	-24 850	-32 400
DIVERSION INTO BASIN	0	0	0	-3 160	-18 250	-30 030	-40 820	-32 220	-19 740	-12 510	0	0	-156 730
NATURAL FLOW ALTA.BDY.	26 500	12 880	100 560	287 880	248 410	938 070	555 610	203 400	103 790	73 200	34 890	21 960	2 607 150

SOUTH SASKATCHEWAN RIVER - BELOW JUNCTION WITH RED DEER RIVER

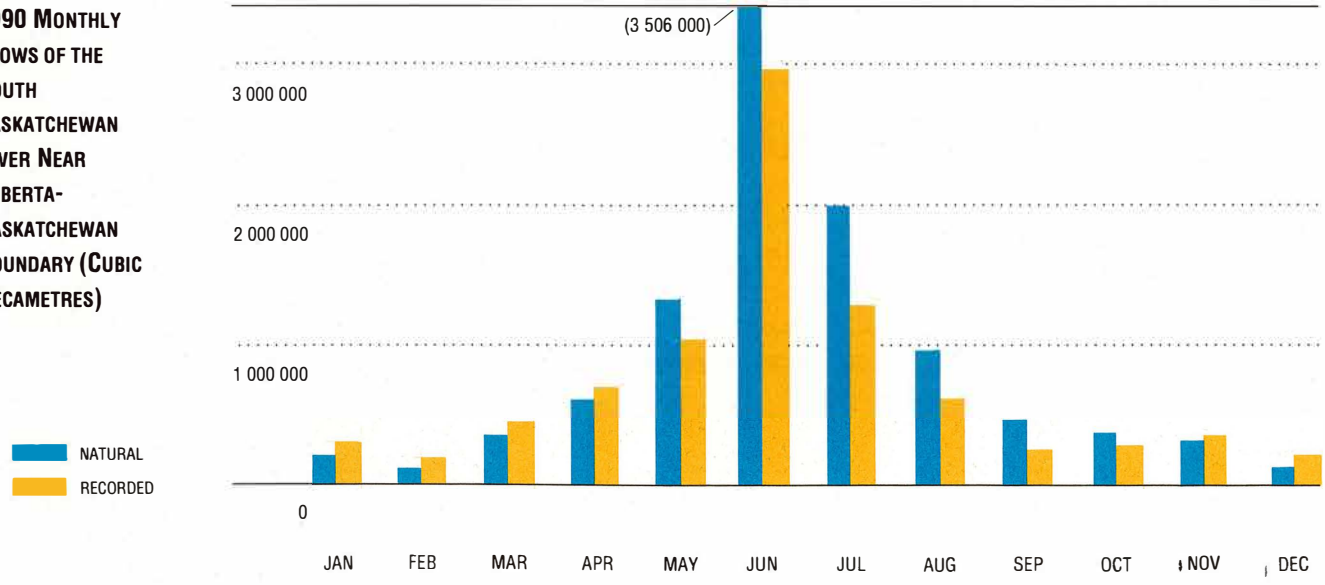
	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.	TOTALS
RECORDED FLOW	309 000	216 000	466 000	713 000	1 045 000	2 976 000	1 292 000	611 000	246 000	284 000	335 000	201 000	8 694 000
NATURAL FLOW	220 000	123 000	370 000	669 000	1 374 000	3 506 000	2 000 000	995 000	479 000	394 000	312 000	129 000	10 571 000

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

ANNUAL FLOWS OF THE SOUTH SASKATCHEWAN RIVER NEAR ALBERTA – SASKATCHEWAN BOUNDARY (CUBIC DECAMETRES)



1990 MONTHLY FLOWS OF THE SOUTH SASKATCHEWAN RIVER NEAR ALBERTA-SASKATCHEWAN BOUNDARY (CUBIC DECAMETRES)



RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THE SASKATCHEWAN-MANITOBA BOUNDARY (in Cubic Decametres) FOR THE 1990 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 720000	1 780 000	1 510 000	1 620 000	1 540 000	1 380 000	1 280 000	1 290 000	1 640 000	1 750 000	1 390 000	1 310 000	18 210000
NATURAL FLOW	1 620 000	2 100 000	2 110 000	2 010 000	1 810 000	1 570 000	1 440 000	1 180 000	1 220 000	1 330 000	1 190 000	1 220 000	18 800 000

SASKATCHEWAN RIVER - SASKATCHEWAN-MANITOBA BOUNDARY

ESTIMATED FLOW	2 020 000	2 130 000	2 970 000	4 160 000	2 290 000	1 290 000	1 140 000	905 000	718 000	696 000	629 000	696 000	19 644 000
APPORTION-MENT FLOW	2 530 000	2 440 000	4 250 000	4 670 000	2 410 000	1 360 000	905 000	385 000	369 000	3 320	62100	203 000	19 587 000

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

RECORDED FLOW	78 500	13 000	9 340	10 600	6 180	2 070	11 100	14 000	6 560	2 070	1 560	5 030	160010
NATURAL FLOW	45 601	25 351	2 675	2 334	295	49	0	0	0	0	0	5 860	82 169

CARROT RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (NEAR TURNBERRY)

RECORDED FLOW	122 000	180 000	49 800	35 000	4 300	2 460	3 700	3 010	2 550	2 190	2 090	2 890	409 990

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

RECORDED FLOW	87 800	79 700	20 500	31 900	1 930	276	703	722	305	139	1	495	224 470

ASSINIBOINE RIVER - SASKATCHEWAN-MANITOBA BOUNDARY (AT KAMSACK)

RECORDED FLOW	106 000	29 300	4 620	1 040	215	122	32	151	400	287	327	473	142 970

RECORDED AND NATURAL FLOWS - SUMMARY SELECTED STREAMS CROSSING THE ALBERTA-SASKATCHEWAN BOUNDARY (in Cubic Decametres) FOR THE 1990 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	395 000	265 000	434 000	896 000	1 000 000	1 910 000	1 820 000	676 000	536 000	425 000	308 000	252 000	8 917 000
NATURAL FLOW	148 000	78 400	244 000	759 000	980 000	2 190 000	2 220 000	1 060 000	660 000	370 000	176 000	68 200	8 953 600

BATTLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	90	693	1 765	1 172	927	408	171	97	220	-	-	5 543
NATURAL FLOW	-	90	699	1 869	1 213	1 019	466	178	101	220	-	-	5 855

LODGE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	1 284	9 495	984	4 150	497	13	1	1	7	-	-	16 432
NATURAL FLOW	-	1 482	10 910	1 191	4 580	544	13	-	3	-	-	-	18 723

MIDDLE CREEK - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	-	124	1 306	185	907	85	24	6	3	6	-	-	2 646
NATURAL FLOW	-	140	1 588	225	949	96	46	15	4	5	-	-	3 068

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

RECORDED FLOW	7 570	6 020	7 400	67 800	87 600	29 000	31 300	8 580	5 020	6 380	4 360	3 390	264 420

BATTLE RIVER - ALBERTA-SASKATCHEWAN BOUNDARY

RECORDED FLOW	2 970	1 410	22 500	108 000	39 900	39 300	94 400	86 900	17 200	10 100	5 460	3 110	431 250

Appendix I

Statement of Expenditures and Final Claim

PRAIRIE PROVINCES WATER BOARD
STATEMENT OF EXPENDITURES AND
FINAL CLAIM

FINANCIAL YEAR
1990/91

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 90/91	EXPENDITURES
Salaries:		
(01) Permanent Staff	$265,700	$249,416
(02) Temporary Staff	0	3,904
(03) Overtime/Other Pay	0	9,568
TOTAL SALARIES	$265,700	$262,888
O & M:		
(04) Travel	$ 15,700	$ 13,992
(06) Postage	1,700	1,273
(07) Telecommunications	6,100	5,061
(10) Printing	9,600	17,047
(11) Profess. Services	46,000	38,396
(12) Training	3,000	869
(13) Temporary Help	4,000	1,646
(14) Personal Services	31,100	31,020
(15) Other Services	14,600	11,322
(16) Rentals	33,000	33,896
(17) Equipment Repair	3,000	140
(20) Purchased Materials	6,000	6,626
(21) Parts & Consumables	2,000	3,771
(23) Equip. Acquisition	6,000	7,266
TOTAL O & M	$181,800	$172,325
TOTAL SALARIES AND O & M	$447,500	$435,213
FRINGE BENEFITS *	$ 23,800	$ 23,660
TOTAL EXPENDITURES	$471,300	$458,873

** Nine percent of Permanent Salaries*

Each province's share (one-sixth of the total amount of $458,873) is $76,479.

FINAL CLAIM **$ 76,479**

Appendix II

Board/Committee Membership

PPWB MEMBERS

CHAIRMAN	D.A. Davis	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
	D.L. MacLeod	Vice President Resource Management 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 Western and Northern Region Inland Waters Directorate Conservation and Protection Environment Canada
A.F. Lukey	Director Engineering Service Prairie Farm Rehabilitation Administration Agriculture Canada
K.R. Smith	Assistant Deputy Minister Environment Protection Services Alberta Environment
W. Dybvig	Chief Planner Saskatchewan Water Corporation
V.M. Austford	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
	V.M. Austford (April/78-Feb/91)	Water Resources Branch Manitoba Natural Resources
	R.J. Bowering (March/91)	Water Resources Branch Manitoba Natural Resources
	A.B. Banga	Resource Management 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

At the request of and under the direction of the Prairie Provinces Water Board, the Committee on Water Quality shall investigate, oversee, review, report and recommend on matters pertaining to water quality of interprovincial and interjurisdictional basins.

Carrying out the above responsibilities may include such things as natural quality assessment; quality forecasting; network design; processing and dissemination of data; determination of implications of proposed projects that may significantly alter the water quality of interprovincial streams; consideration of special problems; establishment of procedures for emergency situations; and other items of interprovincial interest involving water quality.

Approved: October 17, 1972
PPWB Minute 7-33

MEMBERS

CHAIRMAN	R.L. Kellow	Executive Director Prairie Provinces Water Board
	W.D. Gummer	Water Quality Branch Environment Canada
	M. Morelli	Environmental Management Division Manitoba Environment and Workplace Safety and Health
	R.G. Ruggles	Water Pollution Control Branch Saskatchewan Environment and Public Safety
	J.B. Kemper	Environmental Quality Monitoring 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.

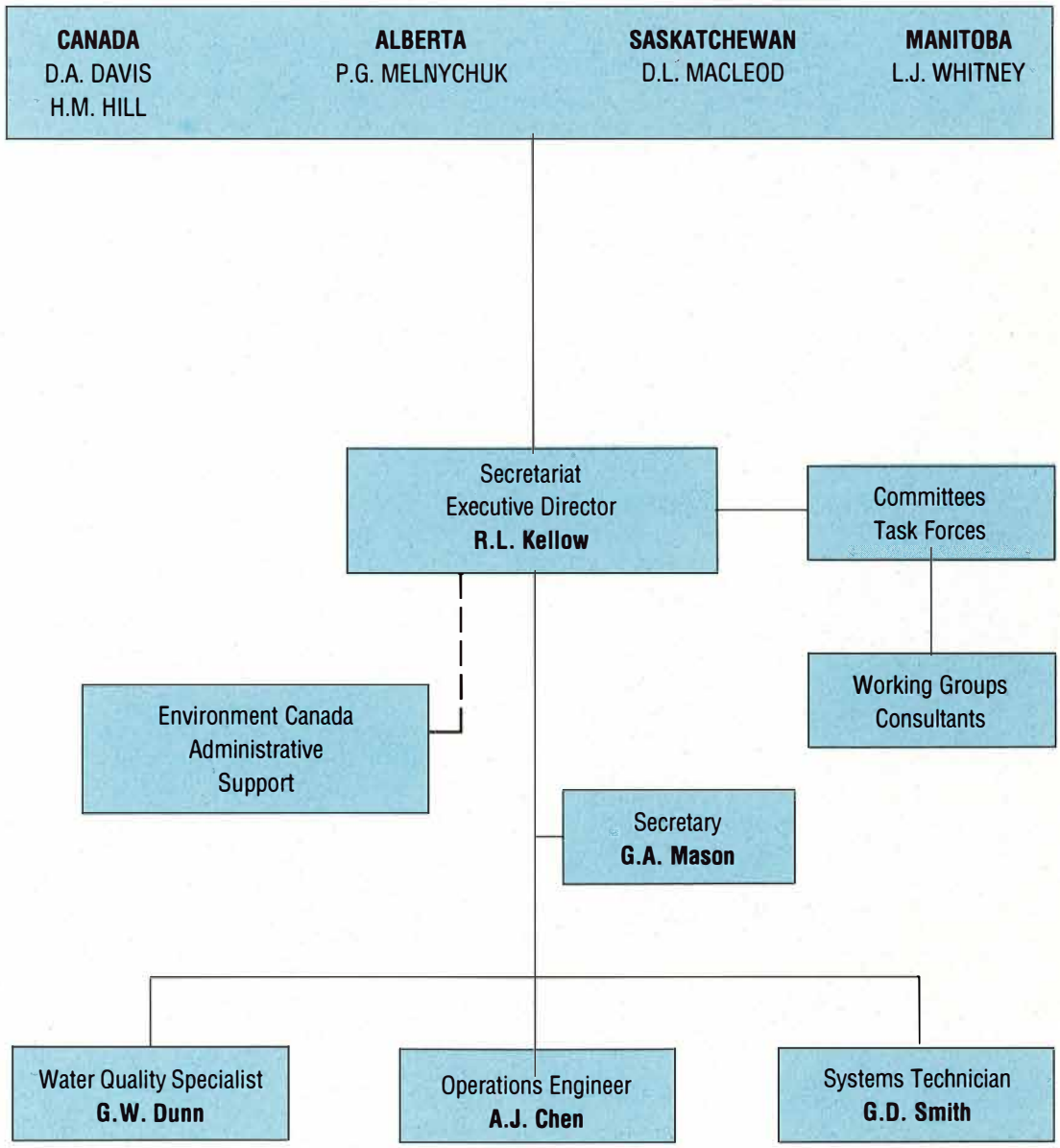
Approved: November 18-19, 1981
PPWB Minute 26-25

MEMBERS

CHAIRMAN	R.L. Kellow	Executive Director Prairie Provinces Water Board
	D. McNaughton (July/85-Aug/90)	Groundwater Division National Hydrology Research Institute Environment Canada
	G.D. Grove (Aug/90)	Environmental Science Division National Hydrology Research Environment Canada Institute
	J. Lebedin	Earth Sciences Division Prairie Farm Rehabilitation Administration Agriculture Canada
	H.A. Kerr	Groundwater Protection Branch Alberta Environment
	N. Shaheen	Resource Management Saskatchewan Water Corporation
	L. Gray	Water Resources Branch Manitoba Natural Resources
SECRETARY	A.J. Chen	Operations Engineer Prairie Provinces Water Board

Organizational Chart

Prairie Provinces Water Board



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