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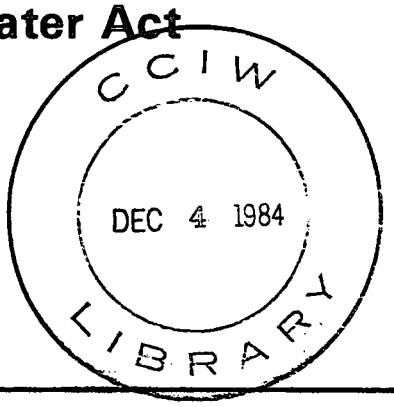
The Canada Water Act

Annual Report

1983-84



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Minister
Environment Canada

Ottawa, Canada
K1A 0H3

Ministre
Environnement Canada

Ottawa, Canada
K1A 0H3

Her Excellency
The Right Honourable Jeanne Sauvé
Governor General and Commander-in-Chief of Canada

May it Please Your Excellency:

I have the honour herewith, for the information of Your Excellency and the Parliament of Canada, to present the Annual Report on the Canada Water Act for the fiscal year ended March 31, 1984.

Respectfully submitted,

Suzanne Blais-Grenier

Canada

Sous-ministre
Environnement Canada

Deputy Minister
Environment Canada

Ottawa, Canada
K1A 0H3

The Honourable Suzanne Blais-Grenier
Minister of the Environment
Ottawa, Ontario

Madam:

I have the honour to submit the Annual Report on the Canada Water Act for the fiscal year ended March 31, 1984.

Respectfully submitted,

Jacques Gérin

Canada

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INTRODUCTION

The Canada Water Act, proclaimed on September 30, 1970, provides the framework for joint federal-provincial management of Canada's Water resources. Section 36 of the act requires that a report on operations under the Act be laid before Parliament as soon as possible after the end of each fiscal year. This, the twelfth annual report, covers operations to March 31, 1984.

In January 26, 1984, the appointment of an Advisory Committee to conduct an inquiry on federal water policies was announced. Highlights of the announcement appear on page 3.

Up to and including fiscal year 1975-76, Canada Water Act funding was provided on the basis of individual projects. In fiscal year 1976-77, Treasury Board established a ceiling on expenditures cost-shared with the provinces (for river basin planning and implementation, and flood damage reduction) at about an $18 million per year level. Subsequently, budget reductions and consequent adjustments to the program have lowered the ceiling for recent years to about $11.8 million for federal-provincial agreements under the Canada Water Act. This is in addition to funding provided in regular departmental budgets for data collection and research programs.

Over the past six years water management programs have been evaluated or assessed in accordance with guidelines established by the Office of the Comptroller General and other central agencies. Program evaluations or similar studies have been completed for programs that account for more than 50% of the resource expenditures. Based on the recommendations given in those reports, action plans have been proposed that will improve the effectiveness of the programs. As part of these plans, 350 data collection platforms are being installed at a rate of 70 per annum at remote hydrometric stations, and additional computer facilities are now being used to improve data processing and interpretation, with the objective of providing more timely water quantity and water quality information required for effective water resource management.

PROVISIONS OF THE CANADA WATER ACT

Part I of the Act provides for the establishment of federal-provincial consultative arrangements for water resource matters (Section 3); and for cooperative argreements with the provinces for the development and implementation of plans for the management of water resources (Section 4 - 7). This part also enables the Minister, directly, or in cooperation with any provincial government, institution, or person, to conduct research, collect data, and establish inventories associated with the water resources.

Part II envisages federal-provincial management where water quality has become a matter of urgent national concern. This part permits the establishment of joint federal-provincial incorporated agencies (although existing federal and provincial corporations might alternatively be used) to plan and implement approved water quality management programs.

Part III of the Act provides for regulations banning the manufacture or import for use or sale in Canada of any cleaning agent or water conditioner that contains a nutrient in a greater concentration than that prescribed by regulations. This is one of the principal means of reducing the rate of eutrophication of water bodies.

Under Part IV are provisions for the general administration of the Act. In addition, it provides for inspection and enforcement, and permits the Minister, either directly or in cooperation with any government, institution, or person, to undertake public information programs.

ACTIVITIES UNDER THE CANADA WATER ACT

Inquiry on Federal Water Policy

Under Section 26 of the Canada Water Act, the federal Minister of the Environment is authorized to establish advisory committees for the purpose of advising and assisting him in carrying out the purposes and provisions of the Act. On January 26, 1984, the Honourable Charles Caccia announced that he was using this provision to appoint an Advisory Committee whose job would be to conduct an inquiry on federal water policy. In making his announcement, Mr. Caccia drew attention to warnings of a coming water crisis comparable to the energy crisis of the 1970s unless new water management strategies are mounted. He went on to say that one important difference between the energy crisis of the past decade and the water situation today is that we have more time to do the homework, as well as the consultation and planning necessary to prevent a water crisis. He said that the time is right to explore new ideas, to seek consensus about future water needs, and to develop innovative policies which will provide long-term solutions for tomorrow's problems. He stressed the need to raise the consciousness of all Canadians about water issues and to involve them in the search for solutions.

Appointed to the Advisory Committee were Dr. Peter Pearse (Chairman), Ms. Françoise Bertrand and Mr. James MacLaren. The Committee will study and make recommendations within 18 months on the following assignments:

1) to identify and substantiate the nature of emerging water issues, including the interjurisdictional dimensions thereof;

2) to identify available supplies and future requirements for the conservation, development and utilization of water resources so as to ensure the enhancement of the health, well-being and prosperity of the people of Canada, including continued regional economic growth and the quality of the Canadian environment, together with estimates of benefits and costs where possible;

3) to seek the views of governments and governmental bodies, private citizens, public groups, industry and the academic community with regard to such issues as future supplies and requirements, and;

4) to assess the needs for and nature of additional scientific and research expertise in water management in Canada.

The Committee's report is expected to propose specific strategies which the Government of Canada could adopt in support of such recommendations. Shortly after their appointment, Committee members began the preparation of an interim report which will serve to facilitate the preparation of briefs by interested individuals and organizations. Meetings with senior federal and provincial officials were being scheduled and a preliminary call for submissions was under consideration. Most of the hearings are expected to take place late in 1984.

PART I: Comprehensive Water Resource Management

Federal-Provincial Cooperation

The Canada Water Act calls for joint consultation between the federal and provincial governments in matters related to water resources. Discussed briefly in the following are joint programs under the national Flood Damage Reduction Program as well as other projects involving the regulation, apportionment, monitoring or survey of water resources, and the preplanning, planning or implementation of Water Management Programs.

Agreements for specific water programs provide for the participating governments to contribute funding, information, and expertise in agreed ratios. For ongoing activities such as the water quantity survey agreements with each province, cost sharing is in accordance with each party's need for the data. For study and planning agreements, it is usual for the federal government to meet half the costs and the provincial government(s) the other half. The planning studies encompass interprovincial, international or other basins where federal interests are important. Cost sharing for implementation is in proportion to federal and provincial responsibilities and often includes a contribution from local governments.

Interdepartmental Committee on Water

The Interdepartmental Committee on Water (ICW) was established in 1968 to promote coordination and to advise on all federal water programs. Since then, ICW has actively pursued its mandate and, on January 24, 1984 held its 53rd meeting since its inception.

A total of 21 departments and agencies with an interest in water matters are represented on this 27-member committee. Subcommittees and Working Groups are set up as required. Currently there are five subcommittees whose areas of interest are 1) the Canada-U.S. Great Lakes Water Quality Agreement, 2) water quality, 3) floods, 4) the preparation of responses to IJC reports and 5) the coordination of federal activities in the Mackenzie River Basin.

In addition to the work of these subcommittees, issues or subjects of interest brought to the attention of ICW over the past year included; the inquiry on federal water policy, a proposed DFO fisheries habitat management policy, the Qu'Appelle conveyance works, a water treatment plant for Regina and Moose Jaw, the Fraser River estuary management plan, the Canadian Heritage Rivers System, soil and water conservation in Western Canada, the English/Wabigoon mercury study, water export by tanker, special recovery capital projects in Ontario, and proposed National & Health and Welfare drinking water legislation.

Federal-Provincial Water Resource Management Programs

Table 1 shows a breakdown of current cost-shared federal-provincial water management programs and indicates the stage each has reached. Each of the programs is referred to briefly in

the following few pages and described in more detail later in this report. Table 2 is a record of the achievements under the Act since its inception in 1970.

REGULATION, APPORTIONMENT, MONITORING AND SURVEY PROGRAMS: Although most federal-provincial agreements carry a time limit within which the objectives of the agreement are likely to be reached, there are some agreements involving monitoring and survey responsibilities which are projected to continue into the foreseeable future without termination. One such program, a new one, on a national scale, designed to coordinate both federal and provincial water quality surveys, came closer to fruition.

The federal government has been involved in the collection of water quantity data since the late 1800s. In earlier years, hydrometric networks were operated under informal arrangements with all provinces except Quebec. The 1922 agreement with Quebec was rescinded in 1964 when the Quebec government took responsibility for most of the hydrometric network in that province. Beginning in April 1975, uniform cost-sharing Water Quantity Survey Agreements were implemented with all provinces and with the Department of Indian and Northern Affairs for the territories. It is recognized that water quantity data are essential to water management and, since the costs of collecting water data are substantial, the efficiency of data collection programs is enhanced significantly by combining networks and standardizing methodology. These agreements recognize that water quantity data may be collected to meet federal needs, provincial needs, or a combination of needs. Hence funding for the operation of the networks is provided according to each party's needs. The water quantity networks and cost-sharing data are determined annually by Federal-Provincial Coordinating Committees. Also, a national meeting of all Federal-Provincial Coordinating Committees is convened regularly to review annual progress reports and to discuss any concerns arising under the Agreements. During the year, a total of 2824 gauging stations were operated under the Agreements in Canada, 2647 by the federal government and 177 by the Province of Quebec. Data from these stations as well as from 720 stations operated mainly by other provincial agencies are contained in the national water data bank - HYDAT; the data bank also contains data for another 3700 discontinued stations. Under the terms of the Agreements, Canada is responsible for maintaining the computer data base and for publishing the data. All hydrometric data are provided free of charge upon request.

The federal and provincial governments also operate networks for the monitoring of water quality. In March 1982, in response to requests from some provinces, the federal cabinet approved a new program providing for federal-provincial cost sharing agreements for water quality monitoring networks. Over the next few years, Environment Canada will be negotiating water quality monitoring agreements with interested provinces to provide for sharing of costs, exchange of data and a Canada-wide quality control program. Negotiations with Quebec are complete and discussions

TABLE 1 - STATUS OF FEDERAL AND FEDERAL-PROVINCIAL WATER MANAGEMENT PROGRAMS

REGULATION, APPORTIONMENT, MONITORING AND SURVEY PROGRAMS

Under Negotiation	New During 1983-84	Ongoing During 1983-84
Water Quality Surveys		Water Quantity Surveys Prairie Provinces Water Board Mackenzie River Basin Committee Water Quality Monitoring-Garrison Diversion Lake of the Woods Control Board Ottawa River Regulation Planning Board Ottawa River Water Quality Coordinating Committee

WATER MANAGEMENT PROGRAMS

Under Negotiation	New During 1983-84	Ongoing During 1983-84
	Winter Basin Planning	Fraser Estuary Planning Wabigoon-English Mercury Contamination Study Waterford River Urban Hydrology (Planning) Study Mercury in Churchill River Diversion System Yukon River Basin Study North Shore (St. Lawrence) Ecological Inventories Study
Qu'Appelle Conveyance Regina-Moose Jaw Filtration Plant*	Special Recovery Capital Projects in Ontario*	Qu'Appelle Basin Implementation Lower Fraser Valley Flood Control Canada-Ontario Agreement on Great Lakes Water Quality

FLOOD DAMAGE REDUCTION PROGRAM

Under Negotiation	New During 1983-84	Ongoing During 1983-84
Initial Agreements with Alberta, British Columbia and Yukon Territory Amending Agreements with Saskatchewan, Ontario and Nova Scotia Agreement for Flood Control on the Saint-François River in Richmond Amendment to Agreement to Upgrade Ring Dykes, Red River Valley	Mille Iles Control Structure Amending Agreements with Quebec and Newfoundland Quebec City Flood Control Agreement	Flood Damage Reduction Works and Dykes, Montreal Region Initial Agreements with New Brunswick, Newfoundland, Manitoba and the Northwest Territories Amending Agreements with Ontario, Manitoba and New Brunswick Upgrading Ring Dykes, Red River Valley.

* Special funds were made available to the department for this program.

TABLE 2 - PROGRAMS OR STUDIES COMPLETED UNDER THE CANADA WATER ACT

Peace-Athabasca Delta Planning	1972
Qu'Appelle River Basin Planning	1972
Saskatchewan-Nelson Basin Planning	1973
Okanagan Basin Planning	1974
Saint John Basin Planning	1975
Lake Winnipeg, Churchill and Nelson Rivers Planning	1975
Great Lakes Shore Damage Survey	1975
Fraser River Upstream Storage Planning	1976
Churchill River Basin Planning (Sask.-Man.)	1976
Montreal Region Flow Regulation Planning Study	1976
Peace-Athabasca Delta Implementation	1976
Northern Ontario Water Resources Planning	1978
Southeastern New Brunswick Dyking Implementation	1978
St. Lawrence Water Quality Planning Study	1978
Souris Basin Planning	1978
Metropolitan Toronto Flood Control Implementation	1978
Lower Saskatchewan Basin Preplanning	1979
Southwestern Ontario Dyking Implementation	1979
Upper Thames Flood Control Implementation	1979
Yukon Basin Preplanning	1979
Ottawa River Regulation Planning Report	1980
Thompson Basin Preplanning	1981
Great Lakes Shore Damage Survey Implementation	1981
Dykes and Flow Regulation Works - Montreal Region	1981
Mackenzie Basin Planning	1982
Shubenacadie-Stewiacke Basin Planning	1982
Ottawa River Water Quality Report	1982
Okanagan Basin Implementation	1982
Prairie Provinces Water Board's Water Demand Study	1983
North Shore (St. Lawrence) Ecological Inventories	1983
Winter River Preplanning	1983
Qu'Appelle Basin Implementation	1984

with Alberta, Newfoundland and British Columbia are under way. The agreements are modelled after the hydrometric agreements, with financing being provided by each government in proportion to its data needs. By 1986-87, if all provinces join the program, the new network is expected to incorporate 450 existing stations of federal interest, upwards of 2000 existing stations of provincial interest, and about 180 new stations of joint interest. These numbers exclude Great Lakes water quality stations which are administered under other agreements. In March 1983, Treasury Board approved the resources required to implement the agreements.

The Prairie Provinces Water Board, a federal-provincial board which administers the Prairie Provinces Master Agreement on Apportionment, continued to provide recommendations to Canada, Alberta, Saskatchewan, and Manitoba concerning the equitable apportionment of eastward flowing interprovincial prairie rivers. During the year, the Board's Committees on Hydrology, Water Quality and Groundwater continued to recommend procedures for natural flow determination, and streamflow forecasting and apportionment for specific sites and proposed projects. A four-year study of historic and current water demands in the three prairie provinces was completed in February 1983 and that information is now being updated. The Board also has approved the report on Administration of the Apportionment Agreement and the report concerning the apportionment to be implemented at the Alberta-Saskatchewan boundary on Battle, Lodge and Middle Creeks. The Board is now working towards an improved methodology to use in establishing site-specific water quality requirements at the eleven interprovincial boundaries where the quality of water is monitored on a continuing basis. Similarly, the Board's Committees are preparing a profile of groundwater protential at the Alberta-Saskatchewan boundary and are developing an approach to deal with the interprovincial problems related to upstream drainage.

The Mackenzie River Basin Committee, with representation from Canada, Alberta, Saskatchewan, British Columbia and Yukon and Northwest Territories met twice during the year to fulfil its liaison responsibilities and to consider study designs, budgets and agreements associated with future implementation of Recommendations 2, 5 and 6, contained in the Mackenzie River Basin Study Report of 1982.

The Ottawa River Regulation Planning Board has a mandate to plan and recommend criteria for regulating the Ottawa River, taking into account hydro-power production, flood protection, navigation, low water problems, water quality needs and recreation. In 1983-84, the mathematical model was operating on a real-time basis during the spring flood period to serve as a guide to reservoir operations. Additional storage and diversion opportunities also were being analyzed.

The Ottawa River Water Quality Coordinating Committee was established early in 1983 to be responsible for reviewing data needs and for coordinating data collection through a joint monitoring program. The setting up of the Coordinating Committee was recommended by the Canada-Quebec-Ontario Technical Working Group on Water Quality in the Ottawa River, whose report was released in October 1982.

Work continued on the evaluation of monitors and preliminary interpretation of data acquired from the water quality monitoring stations related to the Garrison Diversion Project. Discussion with Manitoba has taken place concerning the most appropriate form that future monitoring activities at these sites should take.

The Lake of the Woods Control Board continued to regulate certain waterways in the Winnipeg River basin so as to balance the requirements of the various and sometimes conflicting interests that depend upon the water in the basin. The Board was established under the Lake of the Woods Control Board Act, well before the Canada Water Act was passed, and is described here only to complete the picture on federal-provincial water management in Canada. During 1983, the Board expanded its real-time gauge network in the basin and continued to move in the direction of computerizing its current methodologies and introducing new mathematical modelling activities to assist it in its deliberations.

WATER MANAGEMENT PROGRAMS

Depending upon the nature of the work being conducted, water management programs can fall within any of the three stages - preplanning studies, planning studies or implementation activities. During 1983-84, several water management programs were continued, one new program was initiated under a work-shared Canada-Prince Edward Island planning agreement to determine the reliability of the water supply system in Charlottetown, and the North Shore (St. Lawrence) Ecological Inventories study and most of the Canada-Saskatchewan Qu'Appelle implementation program were completed. Two other implementation agreements were announced that will see Environment Canada coordinate federal contributions to water related programs in Ontario and Saskatchewan; however, these two programs are not being funded under the Canada Water Act.

Preplanning Studies: Preplanning studies normally arise as a result of public representation to resolve one or more problems which are perceived at the local level. The preplanning study has become the vehicle with which to investigate the concerns expressed, and also to examine briefly all of the emerging and potential opportunities and problems of the area in question and to make recommendations as to the desirability of a longer-term planning study.

A preplanning study of the Winter River basin (Prince Edward Island) has been undertaken since 1977 to determine the reliability and sensitivity of the existing water supply system in Charlottetown, Prince Edward Island. This phase was completed in 1983 and a planning study was arranged through an exchange of letters. Funding sought from Canada Water Act and MSERD sources was not approved and the study is being completed under a work-shared arrangement.

Planning Studies: Planning studies generally are directed towards the development or management of the water resources for the social betterment and economic growth of the basin or area under study. A work-shared study on the Winter River discussed above, was the only new study initiated during the year.

Work was completed on the Canada-Quebec ecological inventories program, initiated in 1978-79 on rivers flowing into the St. Lawrence River and Gulf from its north shore. This program, which covers rivers located to the east of the Manicouagan River basin up to and including the Brador River, is intended to facilitate future assessments of ecological impacts from major developments along the North Shore.

A Canada-B.C. Fraser River Estuary Agreement for the development of a Management Plan for the Estuary was completed in March 1982. A review of the proposed management plan was carried out in 1982-83 to determine an implementation strategy. the implementation strategy for the Estuary's Management Plan is under review by both the federal and provincial governments.

In Yukon Territory, program activities were ongoing in the Yukon River basin under the 3-year, $2.2 million Canada-British Columbia-Yukon planning agreement which was signed on November 24, 1980. Joint studies are being conducted that should lead to the formulation of a planning framework under which development alternatives in the basin can be evaluated. The Yukon River Basin Committee succeeded in extending the Agreement to September 30, 1984, without change in funding, in order to complete the studies under way and prepare reports on the completed studies.

In northwestern Ontario, field studies to assess the viability of methods to deal with the problem of mercury in waters and sediments of the English-Wabigoon River system were completed. Preparation of both a technical and a Summary Report have been seriously delayed but have finally been scheduled for release in June 1984.

An exchange of correspondence confirmed the start of a Canada-Newfoundland urban hydrology study in the Waterford River basin of Newfoundland early in 1980-81. Federal input is in the form of work sharing. Field and office work in several project areas is now well advanced and most technical reports are scheduled for completion in 1984-85.

Canada, Manitoba, Manitoba Hydro and the Northern Flood Committee, which comprises the five Indian Bands of Cross Lake, Nelson House, Norway House, Split Lake and York Landing, signed the Northern Flood Agreement in December 1977. This Agreement, which is not under the Canada Water Act, is administered federally by the Department of Indian and Northern Affairs to provide compensation for the effects of Nelson River hydro-power developments, specifically Lake Winnipeg regulation and the Churchill River diversion. It also provides an opportunity for renewed economic and social development in the communities. Article 17 of the Agreement commits Canada, Manitoba, and Manitoba Hydro to joint action for the implementation of the recommendations of the

Lake Winnipeg, Churchill and Nelson Rivers Study Board Report which deals with ecological concerns and to report annually to the Band Councils on progress made. As part of this process, a consent order was issued following arbitration proceedings initiated by the Northern Flood Committee in 1981 that obliged Canada and Manitoba to implement appropriate studies of mercury contamination in the diversion system. This resulted in the Canada-Manitoba Canada Water Act Agreement on the Study and Monitoring of Mercury in the Churchill River Diversion which expires March 31, 1986 and will cost $760,000 shared equally by the two governments. Negotiations are currently in progress to ensure that any other obligations by Canada for ecological monitoring and research are being met.

Implementation Programs: One major implementation program initiated in 1975 on the Qu'Appelle River in Saskatchewan expired in March 1984 while a separate agreement to increase the carrying capacity of the Qu'Appelle River was under negotiation. Also, two federal-provncial agreements were announced under which Environment Canada coordinates federal contributions to water filtration, distribution and wastewater treatment facilities in Ontario and Saskatchewan, but funding for these two agreements falls under legislation other than the Canada Water Act.

The Qu'Appelle Implementation Programs, which was ongoing from 1975 to implement recommendations arising from a comprehensive basin study, expired in March 1984. Projects essentially completed include flood control works for Regina, Lumsden, Tantallon, Moose Jaw, and several reaches of the Qu'Appelle River, the Regina tertiary sewage treatment plant, the Land Use Planning and Development Controls Program and some livestock pollution control projects. Completion of the Qu'Appelle River conveyance program to increase channel capacity in several constricted reaches of the valley is expected to be included under a proposed $4.75 million Agreement under negotiation with Saskatchewan.

In December 1983, a Canada-Ontario agreement was signed under the Special Recovery Projects Program authorizing federal contributions over a two-year period for water treatment, water delivery and sewage treatment facilities at Niagara Falls ($3 million), Sudbury ($2.5 million) and Timmins ($3 million).

Also in December 1983, it was announced that the federal government had approved a contribution of up to $5 million for construction of a Granular Activated Carbon water filtration plant to improve the water supply to Regina and Moose Jaw, in Saskatchewan.

The Canada-British Columbia construction program, designed to reduce damages due to floods in the lower Fraser Valley of British Columbia, continued during the year. Some $107 million of a total joint commitment of $120 million was spent up to the end of March 1984.

A renewed Canada-Ontario Agreement on Great Lakes Water Quality, retroactive to April 1, 1982, and extending to March 31, 1985, was signed on July 12, 1982. This agreement

provides for the cost-sharing of research, surveillance and information activities and reflects the commitments undertaken by Canada in the 1978 Canada-U.S. Great Lakes Water Quality Agreement. It also re-emphasizes the cooperative phosphorus control and Great Lakes surveillance programs and, in accordance with the 1978 agreement, outlines programs for dealing with toxic substances and hazardous materials in the Great Lakes. The annual federal contribution to cost-shared programs continued at a maximum annual rate of $1.2 million. To meet federal responsibilities under the 1978 Canada-U.S. Agreement, Canada also is making $65 million available to the province for the period 1982-1985 to assist in the completion of municipal sewage treatment facilities in the Great Lakes region. On October 16, 1983, Canada and the United States signed a supplement to the 1978 Agreement for the purpose of lowering phosphate levels in Great Lakes waters.

Implementation of a majority of the recommendations arising from the Souris River basin study is being undertaken under existing federal programs, provincial programs and federal-provincial agreements. In particular, a number of the recommendations associated with water supply and flood damage reduction were included in the Canada-Saskatchewan DREE Interim Subsidiary Agreement on Water Development for Regional Economic Expansion and Drought Proofing. This agreement was extended in 1981-82 for an additional two years to March 31, 1984. However, flood damage mitigation funds were not spent because the flood hazard zones were not designated as required under the agreement.

Flood Damage Reduction Program: During 1983-84, this program was actively supported throughout most of Canada.

OBJECTIVE: The Flood Damage Reduction Program follows the cooperative federal-provincial approach of the Canada Water Act. Its overall aim is to reduce flood damages. The first step is to identify flood risk areas and discourage further flood vulnerable developments in those areas. Where existing development warrants it, a second step may be to provide remedial measures.

When joining the program, the provinces sign a General Agreement and a Mapping Agreement (or a combined agreement). The General Agreement outlines the basic approach that will be taken to reduce flood damages. The respective governments, and their agencies, agree not to engage in, or provide assistance to undertakings vulnerable to flood damage in areas designated as flood risk areas. In such areas, federal disaster assistance will be restricted to structures built before designation and, in some circumstances, new structures which are flood proofed. Zoning on the basis of the flood risk is encouraged.

The Mapping Agreement provides for the flood risk mapping and designation of the areas to which the policies in the General Agreement will apply. Forming part of this agreement is a list of communities in the province which are to be mapped and specifications to be followed in

conducting the hydrotechnical and mapping work. When maps not meeting these specifications are available, interim designation may be applied until such time as new maps are prepared. This agreement also requires that information pertaining to the designated area be made available to governments, zoning authorities, the public and anyone contemplating development in or near these areas. Designations to March 31, 1984 are listed in Table 3.

In some cases existing developments in designated areas will still require protection against flood damages and, for this reason, further agreements to study such problems can also be negotiated with the provinces. Where benefits exceed costs and where there is a national interest, federal-provincial agreements may subsequently be reached on implementation action. This action could include flood forecasting and warning, flood proofing, works to control flows and levels, acquisition of property, easements or land use planning. It should be noted that, in examining alternatives, the best choice will be made on the basis of effectiveness, cost, associated benefits and environmental impact. This could mean allowing some flooding to occur.

DURATION: From its beginning, the program was expected to be active for ten years, but an Amending Agreement in 1980-81 extended the General Agreement with Manitoba beyond the ten-year period. Similar extensions occurred in 1981-82 with the signing of an Amending Agreement with New Brunswick and in 1982-83 with the signing of an Amending Agreement with Ontario. In 1983-84 the General and Mapping Agreements with Newfoundland, the Mapping Agreement with Quebec and the Flood Forecasting Agreement with Manitoba were amended. These latter amendments and negotiations with other provinces for similar extensions are discussed in following sections.

PARTICIPANTS AND FUNDING: Canada and the provinces share the costs (see Table 4).

RELATED AGREEMENTS: Several ongoing studies and implementation agreements dealing with flood prone areas in Canada were in force when the Flood Damage Reduction Program was launched. These include two agreements described elsewhere in this report under the titles: Lower Fraser Valley Flood Control Program and Qu'Appelle Basin.

REPORT ON PROGRESS

Newfoundland

Newfoundland joined the FDR Program in May 1981 with the signing of General and Mapping Agreements. The General Agreement, with a duration of 10 years, binds both parties to the basic approach and policies of the Flood Damage Reduction Program. The Mapping Agreement provides $350,000 (equally shared) to map two flood prone areas (Steady Brook and Stephenville). A

TABLE 3 - DESIGNATIONS TO MARCH 31, 1984 UNDER THE FLOOD DAMAGE REDUCTION PROGRAM

LOCATION	NUMBER OF COMMUNITIES MAPPED	NUMBER OF PUBLIC INFO. MAPS	POPULATION[1]	DATE OF DESIGNATION
NOVA SCOTIA				
East River	5	1	16 916	Feb. 84
Sackville River	3	1	7 122	Feb. 84
2 designations	8	2	24 038	
NEW BRUNSWICK				
Fredericton	10	1	65 000	Feb. 80
Perth/Andover	2	1	1 900	Feb. 80
Oromocto to Lower Jemseg	16	1	15 000	Mar. 81
Lower Fredericton to Lincoln	3	1	3 000	Feb. 82
Sussex	15	1	5 000	Sept. 82
Keswick	5	1	1 100	Mar. 83
6 designations	51	6	91 000	
QUEBEC*				
Montréal Region	38	22	1 940 000	May 78
Chaudière Basin	19	8	50 000	Mar. 79
Gatineau/Ottawa Rivers	23	15	283 000	Oct. 79
Upper Richelieu River	21	11	80 000	Apr. 80
du Gouffre	4	2	9 000	Apr. 80
Lower Richelieu River	21	10	125 000	Nov. 81
Rivière l'Assomption	12	4	94 000	May 82
Rivière Saint-François	14	6	170 000	Oct. 82
Rivière Yamaska	19	12	64 000	June 83
9 designations	171	90	2 815 000	
ONTARIO				
White River	1	1	1 000	Aug. 82
Toronto	24	8	3 000 000	Dec. 82
Sturgeon River/Lake Nipissing/ French River	9	5	63 000	Mar. 83
Kaministiquia River	2	1	39 000	Aug. 83
4 designations	36	15	3 103 000	
MANITOBA				
Melita	1	1	1 200	Dec. 79
Wawanesa	1	1	500	Dec. 79
Winnipeg	1	1	565 000	Feb. 80
Souris	1	1	1 750	Oct. 80
Elie	1	1	450	Nov. 80
Brandon	1	1	36 250	Mar. 82
La Salle	1	1	350	Nov. 82
Sanford	1	1	400	Nov. 82
Starbuck	1	1	225	Nov. 82
Swan River	1	1	3 800	May 83
Dauphin	1	1	8 971	Feb. 84
11 designations	11	11	618 896	
SASKATCHEWAN				
Estevan	1	1	9 200	Aug. 80
Oxbow	1	1	1 200	Aug. 80
Roche Percée	1	1	150	Aug. 80
Moose Jaw	1	1	34 000	Oct. 81
4 designations	4	4	44 550	
36 designations	281	128	6 696 484	

1. Figures are approximate and based on 1981 Census data.

Table 4 - FEDERAL-PROVINCIAL FLOOD DAMAGE REDUCTION AGREEMENTS
TO March 31, 1984

	Duration (years)	Total Cost* (dollars)	Expiry Date
NEWFOUNDLAND			
Amending Agreement	-	-	-
General Agreement	12	1 470 000	1993
Flood Risk Mapping Agreement	7	350 000	1988
Studies Agreement	5	480 000	1988
NOVA SCOTIA			
General Agreement	10	-	1988
Flood Risk Mapping Agreement	5	600 000	1983
Studies Agreement	5	300 000	1983
NEW BRUNSWICK			
Amending Agreement	-	-	-
General Agreement	15	-	1991
Flood Risk Mapping Agreement	10	2 000 000	1986
Studies Agreement	10	200 000	1986
Flood Forecasting Agreement - Saint John River basin	10	1 400 000	1987
Flood Damage Reduction - Marsh Creek	4.5	2 010 000(a)	1984
Petitcodiac Sea Dykes Agreement	3 months	160 000	1979
QUEBEC			
Amending Agreement	-	-	-
Combined General and Flood Risk Mapping Agreement	16	6 000 000	1992
(mapping	11)		1987
Dykes and Flow Regulation Works - Montreal Region	5.5	11 556 000(b)	1982
Studies and Implementation of Dykes and Flow Regulation Works - Montreal Region	2	4 500 000(b)	1984
Quebec city Flood Prevention Agreement	2	833 000(b)	1985
Mille Iles River Agreement	3.5	13 100 000(b)	1987
ONTARIO			
Amending Agreement	-	-	-
All Inclusive Flood Damage Reduction Agreement	12	1 200 000(b)	1990
(mapping	7)	8 000 000	1985
MANITOBA			
Amending Agreement	-	-	-
General Agreement	14	-	1990
Flood Risk Mapping Agreement	8	2 190 000	1984
Studies Agreement	9	310 000	1985
Flood Forecasting	5	600 000	1986
Ring Dyke Upgrading Agreement	3	4 500 000(b)	1985
SASKATCHEWAN			
General Agreement	10	-	1987
Flood Hazard Mapping and Studies Agreement (mapping	5)	1 300 000	1982
studies		480 000	
NORTHWEST TERRITORIES			
Memorandum of Understanding	2	225 000(c)	1978
Memorandum of Understanding	10	400 000(c)	1989
(mapping	5)		1984
General Agreement	10	-	1989

* These costs are to be shared equally by the federal and provincial governments except for
(a) 33-1/3% federal, 66-2/3% provincial/local
(b) 45% federal, 55% provincial/local
(c) costs shared equally by Environment Canada and the Department of Indian and Northern Affairs

Steering Committee and Technical Committee were appointed and work got under way to implement these Agreements.

An Agreement to amend the General and Mapping Agreements, and a new Studies Agreement, were signed on June 12, 1983. The Amending Agreement extends the General Agreement by 2 years to 1983, changes the status of the pilot Mapping Agreement to that of a regular agreement, extends the Mapping Agreement by 5 years to 1988, increases total funding of the Mapping Agreement to $1,470,000 (equally shared) and adds nine new areas to Schedule A. The new Studies Agreement has total funding of $480,000 (to be shared equally) and a duration of five years.

Flood risk mapping has been completed for the Stephenville and Steady Brook areas, as has the hydrotechnical study for Stephenville. Work under way includes a hydrotechnical study of Steady Brook; a hydrotechnical study and topographical mapping of Placentia; hydrotechnical and remedial works studies of Badger; and drafting of base map specifications for Badger, Placentia and Rushoon.

A brochure, "Flood Damage Reduction Program", describing the Program in Newfoundland has been produced.

Nova Scotia

After changes in provincial personnel, Nova Scotia has indicated interest in extending the Mapping and Studies Agreements which expired in June 1983.

Two areas, the Sackville River, Halifax County and the East River, Pictou County were designated officially by the Ministers on February 28, 1984. These were the first two designations in Nova Scotia.

The hydrotechnical study for Antigonish has been accepted and the working maps have been completed, the hydrotechnical work on the Truro Study is proceeding, and the Mill Brook (Kentville) remedial measures study is in the final review process.

New Brunswick

Funding in 1983-84 for flood risk mapping was reduced severely due to provincial government restraints, but the budget for flood forecasting was not affected significantly. Emphasis was on planning and public relations rather than new projects.

A number of projects were carried out under the CEIC NEED Program with provincial assistance in the day-to-day supervision. Cross-sectional surveys were done in Nashwaak and Walker Brook (Campbellton). Stage damage work and several critical flood level surveys were carried out on the Saint John River from Fredericton to Lower Jemseg, and in Sussex, Norton and Walker Brook.

Hydrotechnical work was completed for Walker Brook (Campbellton) and Norton but no new mapping was done.

Expropriation required to implement works under the Marsh Creek Implementation Agreement has reached an impasse; works remained unfinished on the Agreement's March 31, 1984 expiry date. A flood study is being undertaken to define the current level of flood protection afforded by the Agreement, to identify the impacts associated with infilling of the forebay, and to define alternatives which should be pursued to fulfill the intent of the implementation agreement. The first meeting of the Study Group took place in October 1983 and an initiation meeting was held with the consultants, Proctor and Redfern, in January 1984.

Quebec

On July 29, 1983 the federal government and the Government of Quebec entered into an Agreement Respecting Flood Damage Reduction Along the Saint-Charles and du Berger Rivers Within the Limits of the City of Quebec. The Agreement provides $833,000 for construction of a spillway dam and spillway ice control structure in Quebec City. The flood protection works were in place and operational, and made it possible to avoid flooding during the second week of December 1983. Auxiliary works remain to be completed.

On August 30, 1983 the two governments signed An Agreement Amending the Agreement Ratified on October 4, 1976, Respecting Flood Risk Mapping Applied to Flood Damage Reduction. The termination date of the Agreement was extended by six years to September 30, 1992. The termination date for the mapping program was extended by five years to September 30, 1987; the cost limit under the mapping portion of the Agreement was increased from $5,000,000 to $6,000,000 to be shared equally, and major additions and deletions were made to Schedule A, the list of places to be mapped.

On December 10, 1983 the two governments entered into an Agreement Respecting Flood Damage Reduction on the Mille Iles River. The 3 1/2 year agreement provides $13.1 million for construction of a flood control structure on the Mille Iles River at Montreal. The Steering Committee has been appointed and has held two meetings.

The lower reaches of the des Prairies and des Mille Iles Rivers in the Montreal area were redesignated officially by the Ministers on June 8, 1983. Three flood risk maps delineating the corrections to the boundaries of the flood zone originally designated in 1978, where released to replace three of the twenty-two maps in the original series. The Yamaska River basin between Chenal du Moine and Saint-Césaire was designated officially by the Ministers June 15, 1983. This was the ninth designation in Quebec. Flood risk mapping of the Nicolet and Bécancour Rivers was completed.

Negotiations were started on a draft agreement for the reduction of flood damages on the Saint-François River in Richmond. Engineering, environmental and technical studies carried out on the feasibility of remedial works satisfied both provincial and federal criteria.

Ontario

The proposed Canada-Ontario Flood Damage Reduction Amending Agreement was approved by the Steering Committee and will be forwarded to the Ministers for their consideration. Proposed amendments include a 5-year extension, provision of an additional $7.4 million for mapping and $1 million for other measures, and revision of Schedule A.

The flood risk areas along the Kaministiquia River in the Lakehead Conservation Authority were designated officially by the Ministers on August 5, 1983. This was the fourth designation in Ontario.

Recommendations have been made for designations in seven communities in Northern Ontario and two Conservation Authorities. These recommendations have been put on hold, however, as the provincial flood plain management criteria are under review.

Phase one of the three-phase Muskoka River Study was completed. An in-house flood frequency analysis study commissioned by the Steering Committee was initiated. Flood risk mapping studies are under way in nineteen Conservation Authorities and several municipalities where Conservation Authorities do not exist.

Manitoba

Effective May 16, 1983 the governments of Canada and Manitoba, through an exchange of inter-ministerial letters, amended An Agreement Respecting Flood Forecasting. The duration of Phase One, "Planning and Design", was extended by one year to March 31, 1984 and the termination date of Phase Two, "Development and Operation", was amended from March 31, 1985 to March 31, 1986.

The flood risk area and floodway in the Town of Swan River and the adjoining areas in the Rural Municipality of Swan River were designated officially by the Ministers on May 11, 1983. The flood risk area and floodway in the Town of Dauphin and the adjoining areas in the Rural Municipality of Dauphin were designated on February 15, 1984. These were the tenth and eleventh designations respectively in Manitoba.

Meetings of the implementation committee for the Red River Ring Dykes Upgrading Agreement were held in Winnipeg to discuss the status of provincial-municipal agreements for the work, and revision of the agreement to add Souris and Ste. Rose du Lac to the original eight communities under the agreement. Progress to date has been hampered by the refusal of some communities to sign agreements with Manitoba to cost share the construction and maintenance, and by delays in right-of-way negotiations with land owners. Negotiations have been completed with Brunkild,

St. Adolphe and Morris, and work for the communities of Brunkild and St. Adolphe has been initiated.

Saskatchewan

Due to public opposition to some proposed designations, Saskatchewan has let the Mapping Agreement expire while it assesses its flood plain management policies.

Several hydrotechnical reports from previous commitments have been completed and will form the basis for future flood plain mapping if a new agreement is signed.

Alberta

The province is giving consideration to joining the program in the form of a designation agreement, a public information agreement and a cost-sharing mitigation agreement based on existing provincial flood plain maps.

British Columbia

British Columbia has shown renewed interest in joining the program. Negotiations on a draft agreement continued during 1983-84.

Northwest Territories

The Steering Committee has requested an extension to the Agreement and Memorandum of Understanding in order to complete the mapping. A Treasury Board submission is being prepared to extend the expiry date of the Agreement and appended Memorandum of Understanding, and that of the mapping portion of the Memorandum of Understanding, by 3 years each. Schedule A also is expected to be revised to include the communities of Fort Liard and Nahanni Butte.

Base maps have been completed for Hay River, Fort Simpson, Fort Good Hope, Fort McPherson, Aklavik and Tuktoyaktuk. Work is progressing well at Fort Norman. Flood hazard delineation has been completed for the communities of Hay River, Aklavik and Fort Good Hope, and nearing completion at Fort McPherson and Fort Simpson.

The final floodline maps for Hay River were completed and the process for production of a public information map is under way.

The Institute for Ocean Sciences has been contracted to delineate the flood hazard in Tuktoyaktuk through use of a storm surge model. However, some supplementary studies are required before a designation recommendation can be made.

Yukon

In 1983-84 other priorities as well as lack of resources in the Yukon Territorial Government temporarily, halted negotiations toward an agreement.

Indian Lands

It was decided that a short enabling Memorandum of Understanding between the Departments of the Environment, and Indian and Northern Affairs (DINA) should be drafted to allow interested Indian bands, with the support of regional offices of DINA, to take advantage of the flood risk mapping program.

FDR Program Technical Committee Members Workshop

An FDR Program Technical Committee Members Workshop was held in Hull, Quebec on February 15 and 16, 1984. Approximately fifty persons from provincial and federal government agencies, and one invited speaker from the private sector, attended. The purpose of the workshop was for Committee Members to meet each other and exchange information and experiences on implementing the Program.

Water Research Under the Canada Water Act

Research is carried out in the Inland Waters Directorate in support of operational Branches and departmental objectives. The in-house research programs are undertaken by the National Water Research Institute and the National Hydrology Research Institute. Support of related research in Universities takes place through a subventions program. Undertakings are summarized below:

1. The National Water Research Institute (NWRI)

NWRI carries out water research under the Canada Water Act to address chemical, physical and biological environmental problems of lakes, rivers and reservoirs and also urban and coastal regimes. Field and laboratory studies are undertaken by five research divisions in Burlington, Ontario, and two regional groups in western Canada to advance knowledge and find solutions to problems in hydraulics research, aquatic ecology, environmental contaminants, analytical methods and aquatic physics. Some studies are undertaken in response to problems in specific geographical locations while others are national in scope.

(a) Hydraulic Research: Research on river processes has included the mixing as well as the mass and heat exchanges taking place in open channel flow, with emphasis on the development of models which can predict the mixing of effluent and the response of rivers to man-made changes. Other related projects include the mechanics of ice-jams, the conveyance capacity of an ice-covered river, and the effects of frazil ice on river

flow. Work has also been done on techniques for control and recovery of oil in ice-covered waters. Urban water resources research has emphasized the development and verification of models for urban runoff quantity and quality and the effect of urbanization on urban drainage in order to improve management and design of stormwater systems.

Studies of surface waves have concentrated on air/water interaction such as the generation and propagation of waves. Shore resources and geological influences were documented by conducting technical surveys and interpretation of nearshore sediments, mainly in the Great Lakes. Studies in shore dynamics investigated nearshore waves and currents, nearshore sediment movements, and mechanisms of bluff behaviour. Studies are under way to evaluate the environmental risks associated with artificial islands.

(b) Aquatic Ecology: Nutrient pathways research has included projects on biologically available phosphorus in the water and sediments, the effects of various nutrients on algal growth, and the composition of organic compounds in lake water and their role in the aquatic environment. Original discoveries were made in terms of phosphate availability and its turnover time, nitrogen cycle in prairie lakes and identification of high-molecular weight colloidal fibrils in fresh water.

Studies have been completed on the Bow and Oldman Rivers of the South Saskatchewan River system to determine seasonal and distance effects upon partitioning of nutrients and contaminants among solution, suspended sediments and aquatic plants. Studies of benthic communities in the Qu'Appelle River Lakes and elsewhere are continuing in order to determine historical and contemporary anthropogenic stress in prairie aquatic ecosystems.

Great Lakes research has included the investigation of hypolimnitic oxygen depletion in Lake Erie, the mechanisms by which phosphorus is eliminated from lakes or regenerated from sediments, and the development of a new oxygen-profiling system for large lakes. Special attention has been given to long-term trends in Great Lakes recovery.

Research studies on the impact of acid rain have emphasized changes in lake chemistry and ecology due to human action as evidenced in the sedimentary record. Particular studies include the effect of lake acidification on cycling of organic matter in lakes, release of metals and nutrients from acidified sediments, the sulphur cycle and paleoecology, with emphasis upon biota that indicate the acid status of lakes. Macrophyte studies on the Eurasian milfoil and other aquatic weed infestations concentrated on the long-term impact of macrophyte harvesting, physiological response of aquatic weeds to mechanical and chemical control, and survival and spreading of exotic aquatic plants in Canada.

(c) Environmental Contaminants: Research on environmental contaminants including organics, inorganics and radionuclides has been in three categories.

The first, associated with the study of actual pathways at contaminated sites, involves chemicals of public concern such as PCBs, chlorophenols, arsenic, and plutonium. The major study sites in 1982 were the Niagara River, Lake Ontario, and Canagagigue Creek.

The second category encompasses experimental sites where investigation of processes controlling environmental responses were studied or where additions of contaminants were made and their fates traced. These include the Turkey Lakes Watershed north of Sault Ste. Marie where the processes controlling responses to acid rain and atmospheric contamination were being investigated, and the 50-Point Conservation area where 2, 4-D has been added to a set of experimental ponds.

The third category included laboratory determinations and theoretical physical-chemical calculations. The laboratory work included tests of microbial and fungal biodegradation, photodegradation, hydrolysis, surface water properties, water lipid partitioning, sorption and volatility, and algal bioaccumulation. The theoretical calculations included structure-activity correlations to predict environmental hazards, electron orbital calculations to predict degradation products, and assessment of computer models for contaminant fate in aquatic ecosystems.

The Tobin Lake reservoir in Saskatchewan is the site of an inter-agency study of response of benthic organisms to contaminant stress in the North Saskatchewan River system. Mercury cycling in aquatic foodwebs and its implications for human health in northern Manitoba reservoirs and the Qu'Appelle River Lakes continue to receive special attention in western Canada.

(d) Analytical Methods: Analytical methods research has concentrated on the use of techniques such as high pressure liquid chromatography, gas chromatography, gas chromatography-mass spectrometry, atomic spectroscopy and electrochemical techniques. Projects recently completed include methodologies for polynuclear aromatic hydrocarbons, carbamates, trace metals, total organics, 2,3,7,8-Tetrachlorodibenzo-p-dioxin and other dioxin isomers. These methods have been transferred to Water Quality Branch analytical laboratories for routine use. A radioimmuno assay screening technique for dioxins was under development.

Research work was also carried out in the area of identification and confirmation of trace organics in samples from the Great Lakes using high resolution gas chromatography-mass spectrometry. A special clean and hazardous chemicals laboratory,

completed in 1981, is being used primarily for methods development research involving hazardous compounds such as dioxins, or ultra-trace contaminants requiring a special ultra-clean working environment.

Regional, national and international interlaboratory quality assurance programs are operated to ensure that data generated by different laboratories are comparable.

Microbiological toxicity testing procedures have been assessed and a yeast test for mutagens was improved to eliminate weaknesses that became apparent in testing. Bacteriological surveys of Lake Ontario have been undertaken and microbiological studies of lakes stressed by acid rain indicated that several microbial species were adversely affected.

(e) Aquatic Physics: Research was completed on the development and validation of a five component optical water quality model for Lake Ontario, and a two dimensional hydrogeological model of contaminant transport in an unconfined homogeneous aquifer. Water quality and aquatic ecosystems models were developed to simulate the temporal and spatial distributions of dissolved and suspended materials in the nearshore and off-shore lakes. Based on a general modelling framework, limnological research results in the physical, chemical and biological sciences can be combined into an overall model capable of simulating the effects of contaminants in the aquatic ecosystem. A comprehensive model to simulate the water quality and oxygen depletion in Lake Erie was completed. Investigation of the physical factors influencing contaminant transport in the Niagara River plume and modelling of that transport is now under way.

In western Canada, field and theoretical studies are focussed on physical dynamics of prairie lakes in order to improve understanding of the eutrophication processes. Instrumentation was developed for measuring baroclinic mass exchange under ice in northern Manitoba lakes. Measurements of the mass exchange under the ice of Yukon lakes have been undertaken with the objective of modelling such processes.

Two scales of models have been developed to relate surface water acidification to the deposition of acidifying substances by atmospheric transport. A small basin-scale model simulates short episodic event acidification while a general regional-scale model relates sulphate deposition to the regional cation yield to estimate the regional loading consistent with acceptable levels of surface water acidity.

2. The National Hydrology Research Institute (NHRI)

NHRI, with headquarters in the Ottawa-Hull Region, specializes in research related to underground waters, snow and ice, and surface water. A sod turning exercise is

scheduled for September 1984 to begin the construction of a permanent home for the institute at Saskatoon. Construction is expected to be completed in 1986.

(a) Ground Water Research: Ground water contamination from many sources, for example, landfills, mining developments and acid rain, is becoming of increasing concern. A number of investigations are being conducted to study the natural processes involved in the movement of contaminants in the subsurface and to solve the problems they present. They include a major intensive study at Chalk River, Ontario, using tracer tests, and a major intensive study of toxic chemical migration at Gloucester, Ontario, where the emphasis is on the development of remedial technologies. Solute exchanges between water and aquifer are being investigated. Arsenic contamination due to natural geochemical processes or mining operations is a potentially significant hazard in many parts of the country and has been studied at selected areas in New Brunswick, Nova Scotia and Ontario. Pesticides can also present ground water contamination problems and a study is under way near Osoyoos, British Columbia, where it is suspected that surface waters are becoming contaminated by pesticide-bearing ground waters. This study may be expanded with funding from the Toxic Chemicals Management Program. A major research project sponsored by Atomic Energy of Canada Ltd. is examining ground water aspects of the underground disposal of nuclear wastes in crystalline rocks. Data from boreholes up to 1000 metres deep are subjected to various analytical and numerical analysis techniques to determine hydraulic parameters. The effect of the ground water-aquifer system in mitigating the adverse effects of acid rain is under investigation, principally at a field site near Sault Ste. Marie.

In the North, research is directed towards ground water discharge and recharge under permafrost conditions, the effect on the ground water regime of engineering structures and developments such as pipelines and roads, and the relationships between ground water flow systems and mining excavations.

Geophysical studies are being carried out in support of the solution of ground water problems. Modelling is a fundamental part of ground water studies and the models developed are used to solve both quality and quantity programs. An increasing amount of assistance is being provided to various Environment Canada agencies pertaining to the ground water aspects of the environmental impacts of various developments, particularly in Southern Ontario.

(b) Snow and Ice Research: Glacier research is an important element in snow and ice research. An ice coring project on Mount Logan, Canada's highest mountain, is starting

to yield information on past climate changes on the basis of isotope and other analyses performed on portions of the ice cores by laboratories in Canada and abroad. The core has been processed to 1880 AD (65 m depth along the core) and a revised estimate of the full time span of the core is now about 300 years. A possible future core site at the head of the Donjek Glacier has been located, where a thermal corer now under construction, would be used.

Investigations on Cathedral Glacier, Yoho National Park, were initiated in 1983 as a result of a request from Parks Canada to conduct an assessment of the geophysical and glacio-hydrological nature of this glacier. In 1978 and 1982, a jokulhlaup-like outburst and mudflow occurred above the CPR spiral tracks at Kicking Horse Pass, causing damage to the railway line, a locomotive and the Trans Canada Highway. A preliminary research proposal was prepared and some field work conducted in August 1983.

Eight index maps covering glaciers in the Iskut and Stikine river basins have been drafted. Interpretation of ice features in Glacier National Park is virtually complete. Other work continues on the inventory of glaciers contributing to the headwaters of the Yukon River. It is anticipated that the basic compilation of all Yukon glaciers will be finished shortly. Procedures for digitizing inventory data and reducing it to the standard format have been developed. Studies are now under way with Waterloo University on the use of Landsat digital data for some inventory and related work.

Three glaciers were under continuing investigation in the Iskut River basin. Studies to determine mass balance and to assess glacier melt contribution to the Homathko River, for a hydroelectric power feasibility investigation, also continued. Measurements of winter and summer balances and meltwater flow were conducted on Sentinel and Place Glaciers; mass balance only was measured on Helm Glacier.

Observations on flood hazards from Natavas and Flood Lakes, in the Iskut and Stikine River watersheds, showed no impounded water in Natavas Lake during the summer, although Flood Lake was filled to capacity (approximately 200 x $10^6 m^3$) and discharged two-thirds of this stored water in August.

Many large scale processes in snow hydrology depend ultimately on snow structure and metamorphism. In 1983 emphasis was given to improving our knowledge of the structure and metamorphism of dry and wet snowpacks.

In the laboratory, work on the mechanical and electrical properties of ice and permafrost is continuing. The strength and deformation properties of ice, frozen sand, and frozen clays are being studied in order to determine the amount of unfrozen water present in such materials, and its hydrologic significance. A new project on the role of the strength of ice related to river ice jams will be initiated in 1984.

Experimental and theoretical work on the effect of impurities on the electrical properties of ice, is continuing. This work is of particular importance to the development of sound engineering practices in the North, and to the interpretation of remotely sensed data on ice covers.

(c) Surface Water Research: Surface water research emphasizes the investigation of watershed processes, particularly those that characterize elements of the hydrologic cycle other than the ground water and perennial snow and ice regimes, and the development and testing of precipitation-runoff models. Hydrologic processes in permafrost, alpine and prairie environments are of particular interest. This array of studies includes the interactions between Arctic streams and permafrost, lake dynamics and flooding in the Mackenzie Delta, and an interrelated mix of studies on freeze-up, break-up, ice jamming and other fluvial processes in the Liard-Mackenzie River system and the Mackenzie Delta, and the processes controlling the impact of land drainage on the streamflow characteristics of watersheds. Studies are also being conducted in four tundra/taiga basins along the proposed route of the Inuvik-Tuktoyaktuk Highway. Modelling activities include the design of statistical streamflow forecasting models with and without climatic forecasting ability, approximation of cascades of reservoirs, the design of a model to relate runoff volumes to antecedent values of tension storage, gravity storage and snow cover in a basin, the development of a physically based model of water flow in snow-covered terrain, the sensitivity analysis of a passive microwave snow cover model to a range of snow cover and soil moisture conditions and the operational testing of a modified UBC precipitation-runoff model that accounts for contributions of meltwater from glacierized areas. This division also conducts remote sensing studies including the application of gamma ray and passive microwave to the measurement and observation of snowpack water equivalent, the use of aerial photography for surface water velocity measurements in rivers with moving ice and the application of resistivity and time domain reflectometry to ice thickness measurement.

Significant advances have occurred in a number of research areas during the past year. In the remote sensing field, technology transfer of an operational system for measurement of snowpack water equivalent based on airborne gamma ray techniques is under way. Technical and financial support was provided to Souris basin, Lake Superior and Saint John basin gamma ray studies. A new methodology for determining base flow recession curves has been developed and published (NHRI paper No. 132). A guide plus forms for conducting river ice surveys has been completed and distributed to interested parties. Other published studies on climatic change and water resource planning, Yukon

river break-up at Dawson, stochastic rainfall- runoff relations, risk avoidance in water resources, energy balance over melting snow, and relationships between temperate lake ice cover, radiation and oxygen deficits indicate the spectrum of research conducted last year in the Surface Water Division.

The land drainage project is progressing with the final selection of long-term study areas in Manitoba and Quebec. Field test plots have been selected and soil analysis has been completed in the Mannes-Domain drains south of Winnipeg, and technical assistance is being provided to study development at Ormstown, Quebec. Data collection in these areas will begin this year.

Northern research has been expanded by the addition of a number of studies related to the effects of proposed regulation of Liard-Mackenzie River flow. These studies include examination of the Liard and Mackenzie Rivers thermal regime above and below their confluence at Fort Simpson, ice jamming in the vicinity of the town, and the effects of break-up on the stability of shoals and islands near the junction of the two rivers. In the Mackenzie Delta, regulation of flow may affect the replenishment of numerous delta lakes and the stability of delta channels. As a consequence the water balance of a closed delta lake, as well as the patterns and processes of delta channel change, will be studied over a period of some years.

3. Water Resources Research Subvention Program

In 1983-84, 13 universities across Canada received a total of $250 000 in grants to carry out research as an adjunct to the Inland Waters Directorate in-house research programs. The 17 water-related environmental research projects supported were focussed on regional and national water research topics associated with acid rain, toxic substances, the socio-economic impact of flood damage reduction, water conservation and aquatic nutrients. The aims of the program are to stimulate development of water resources research across Canada, to encourage development of innovative ideas by non-governmental scientists, and to foster closer contact between those scientists and their counterparts in Environment Canada.

ACTIVITIES RELATED TO THE CANADA WATER ACT

Not to be overlooked in the review of operations under the Canada Water Act are various activities which provide indispensable information for effective water planning and management.

Socio-Economic Studies: Within the framework of the Canada Water Act, socio-economic techniques are developed in the interest of conducting studies and providing technical and policy inputs as well as socio-economic techniques in support of water management in Canada. During the year,

studies were continued or completed on the following: a) development of Productivity Indicators aimed at measuring natural resources gains and losses; b) the impact of socio-economic damages caused by low flows on the Ottawa River; c) groundwater requirements for western coal development to the year 2000; and d) water charges to power companies. Phases II and III of the assessment of water supply conflicts to energy development, dealing with possible future water shortages in a number of river basins, primarily in Western Canada, was continued, with the development of a national water use model (Phase II) and an agricultural sub model (Phase III).

The 1981-82 Industrial Water Use Survey was completed and the results are expected to be published later in 1984. The 1982-83 Municipal Water Use Survey was tabulated and summarized, and its survey results are also scheduled for publication later in the year.

On the international scene, seven papers were prepared for presentation to international workshops and seminars, including the Economic Commission for Europe (ECE), the Organization for Economic Cooperative Development (OECD), and the International Water Resources Association. The topics included: groundwater management; water demands; operational use of reservoirs; flood management; drought management; transboundary cooperation, and water pricing. Also, a number of papers on industrial development and water resources were presented at various resource conferences across Canada, for example, the Canadian Development Conference at Queen's University, and the Canada Water Resources Association Conference at Saskatoon in June, 1983.

Socio-economic policy advice was provided during the year on wide-ranging topics, including the development of revised federal benefit-cost guidelines for the National Flood Damage Reduction Program, for departmental information programs and workshops, and for the annual meeting with non-governmental organizations under the departmental public consultation policy.

Public Consultation: In May 1983, more than 30 citizens and members of various non-governmental organizations participated in a one-day workshop in Ottawa to discuss Canadian water issues. This meeting was one of several held throughout Canada under the Environment Canada Public Consultation Policy. These meetings and further consultations with representatives from other federal departments, industries and universities, are providing a sounding board for the many ideas and recommendations influencing government policy.

Water Data: Programs for the systematic collection and compilation of data on streamflow, water levels, sediment transport, ground water, water quality, and related information on glaciers, snow and ice predated the Canada Water Act but have continued to operate in support of water management basin studies and implementation programs. A newer innovation is the collection of background data on water use in Canada.

At the National Water Research Institute in Burlington, Ontario, water data activities in support of water data collection include programs of quality assurance and analytical methods adaptation for the water quality program and current meter calibration for the water quantity program.

Data Management Systems: Data and information reference systems continue to be operated in support of water resource activities. WATDOC, the water resource document reference centre, gives direct access nationwide by computer terminal to an inventory listing of published water-related papers and reports through a publicly available on-line interactive storage and retrieval system. This reference system was recently broadened to cover environmental baseline data in general. NAQUADAT, the national water quality monitoring program's data bank, was designed to store and retrieve chemical, physical, bacteriological, biological and hydrometric data relevant to water quality for surface waters, ground waters, wastewaters and sediments. STAR, a data storage and retrieval system, was developed to handle limnological data from Great Lakes monitoring cruises. WATENIS, the water effluent national information system, provides an inventory of industrial and municipal water pollution sources including data on physical, chemical, and toxicological characteristics of effluents and information on water effluent regulations and guidelines. MUNDAT, a data-base covering municipal waterworks and wastewater systems from coast to coast, including data on federal facilities, was developed in close cooperation with the provincial governments and the Federation of Associations on the Canadian Environment (FACE). HYDAT, the national surface water data bank has been developed to store and retrieve streamflow, water levels, and sediment transport information collected under the Federal-Provincial Water Quantity Agreements, and a Glacier Data and Information System has been designed to contain a compilation of physical dimensions of Canadian glaciers and a bibliography of Canadian glacier documents. CHOMS is a database which provides an inventory and summary description of selected operational techniques and procedures used to collect, process and manipulate hydrologic data in water resources studies. The CHOMS database was developed as the Canadian contribution to the HOMS project of the World Meteorological Organization (WMO) for the organized transfer of hydrological technology operationally used in water resources investigations by member countries of WMO.

PART II: Water Quality Management

No water quality management areas, as defined under Part II of the Canada Water Act, have been set up. However, there are a number of federal-provincial implementation agreements under which water quality management programs have been or are being implemented. These include programs in the Great Lakes basin and in the Okanagan and Qu'Appelle basins. While these

agreements do not provide for the establishment of water quality management agencies under Part II of the Act, they nevertheless have the same objectives of maintaining and improving water quality and are managed by joint federal-provincial Boards. The federal government, in concert with provincial governments, has completed the development of water quality management strategies for the St. Lawrence River (Quebec), the Souris River (Manitoba-Saskatchewan) and the Shubenacadie-Stewiacke Rivers (Nova Scotia). Also, a Canada-Ontario-Quebec Coordinating Committee is working to establish a water quality monitoring plan for the Ottawa River, a Canada-Ontario Task Force is producing a final report on mercury contamination in the English-Wabigoon rivers system and a Canada-Manitoba Team is undertaking to monitor and study mercury in the Churchill River diversion.

At its fall meeting in 1983, the Canadian Council of Resource and Environment Ministers (CCREM) established a Task force on Water Quality Guidelines. The Task Force was asked to inventory water quality criteria and guidelines used throughout Canada; consider recommendations for harmonizing of guidelines; identify emerging issues; and assess the ability of current criteria to deal with the issues. The Task Force will be reporting to the CCREM in the fall of 1984.

PART III: Regulating Nutrient Inputs

The federal government launched its phosphorus concentration control program in the late 1960s. Regulations limiting the maximum phosphorus content of laundry detergents to 8.7% elemental phosphorus (P_2) by weight, or 20% phosphorus pentoxide (P_2O_5), were established in 1970. At that time, an inspection program was introduced under which product samples were collected from manufacturers and importers for government analysis. It is estimated that these first regulations resulted in a 22% reduction in the amount of phosphate discharged from all detergent sources (from 26,000,000 kilograms to 20,000,000 kilograms per annum).

On January 1, 1973, the maximum permissible phosphorus content for laundry detergents was reduced to a maximum of 2.2% elemental phosphorus by weight (5% phosphorus pentoxide). The revised regulations resulted in a further reduction in the amount of phosphate discharged from all detergent to 5,000,000 kilograms per annum.

Results of detergent samples collected in Ontario during the 1983/84 fiscal year indicated that out of all products tested, 7% were in violation of the current regulations. The companies which manufactured or distributed these products were notified and the products in violation were subsequently removed from the shelves and reblended to ensure compliance with the regulations.

The violations that were observed were determined to be mechanical in nature resulting from improper mixing, formulation or clean-up procedures. This resulted in violations for small batches of products which, in most cases, only marginally exceeded the regulated limits. Generally, violations did not come from the large distributors or manufacturers and all problems to date have been rectified without resorting to formal prosecution.

In 1983, in concert with the reorganization of the Environmental Protection Service, the responsibility for compliance monitoring and enforcement of the Phosphorus Concentration Control Regulations was assigned to the Commercial Chemicals Branch, Environmental Protection Programs Directorate.

PART IV: Public Information Program

Although the Flood Damage Reduction Program continued to be the main focus of media announcements during the year, the appointment of an inquiry on federal water policy stood out as the major announcement during the year.

On January 26, 1984, an Advisory Committee was appointed to conduct an inquiry on federal water policy. The Committee will report and make recommendations within 18 months on a number of water issues and, in particular, on specific strategies which the Government of Canada should adapt to resolve the issues.

Numerous important announcements were made under the National Flood Damage Reduction Program to show how governments can and are dealing with flood problems. One announcement in June 1983 dealt with the signing of the Canada-Newfoundland Extension Agreement to amend the General and Mapping Agreements, as well as the signing of a new Studies Agreement. Another, in August 1983, announced the signing by Canada and Quebec of an Agreement amending the Agreement ratified in October 1976 Respecting Flood Risk Mapping Applied to Flood Damage Reduction. Announcements also were made with the signing of two Agreements for flood control construction in Quebec, one in August 1983 for works on the St. Charles and du Berger rivers in Quebec City and the other in December 1983 for a flood control structure on the Mille Iles River near Montreal. Other releases, six in all, dealt with designations of flood risk areas in Ontario (Sturgeon River/Lake Nipissing/French River, March 1983), (Kaministikuia River, August 1984); Quebec (Yamaska River, June 1983) and Nova Scotia (East River and Sackville River, February 1984).

In December 1983, it was announced that the federal government will contribute up to $5,000,000 for improvement of municipal water quality in Regina and Moose Jaw. Another, in the same month, dealt with a contribution of up to $8.5 million for water treatment, water delivery and sewage treatment facilities at Niagara Falls, Sudbury and Timmins, all in Ontario. Funding for these projects is not, however, from Canada Water Act funds but personnel administering the programs are those associated with Canada Water Act programs.

Separate announcements were made in April 1983 concerning a Canada-Ontario- Quebec Agreement Respecting Ottawa River Basin Regulation and a Canada-Ontario-Quebec Water Quality Coordinating Committee.

A joint Canada-Ontario announcement was released in April 1983 dealing with a water management improvement study of the Muskoka River system.

A display on the flood damage program was produced for use by the four Atlantic provinces.

A special issue of Environment Update featuring water was published in November 1983, with articles covering a wide range of water management issues.

A sound slideshow discussing Canadian water management issues was produced for national distribution.

TABLE 5 - CURRENT AND PROJECTED RELEASE DATES OF FINAL REPORTS ARISING FROM CANADA WATER ACT STUDIES

Report	1983-84
English-Wabigoon Mercury Summary Report	mid - 1984
Yukon River Basin Study Report	early 1985

Available upon request from: Director, Water Planning and Management Branch, Inland Waters Directorate, Department of the Environment, Ottawa, Ontario, K1A 0E7.

PRINCIPAL FEDERAL-PROVINCIAL COOPERATIVE ARRANGEMENTS UNDER THE CANADA WATER ACT

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REGULATION, APPORTIONMENT, MONITORING AND SURVEY PROGRAMS

1. WATER QUANTITY SURVEY AGREEMENTS

Objective: To maintain a viable and efficient national water quantity survey network and to give recognition to joint federal and provincial responsibilities in this activity.

Duration of Agreement: Agreements between Canada and each province were signed in 1975 and letters were exchanged between the Department of Environment (DOE) and the Department of Indian and Northern Affairs (DINA) agreeing to joint survey operations in the territories. The programs are continuous but there is a provision in each agreement for termination on 18 months written notice.

Participants: CANADA.....Department of the Environment, and the Department of Indian and Northern Affairs representing the Yukon and Northwest Territories.
ALL PROVINCES

Arrangements: This is a shared-cost program, with the federal government carrying out field and office procedures and invoicing the provinces quarterly. An exception is Quebec which operates its own program and invoices the federal government quarterly except for international and navigable waters, and waters crossing federal land in Quebec, which are surveyed by the federal government. DINA transfers funds annually to DOE for the territories' share of costs.

Funding: 1983-84 (provisional costs)

Total Program Cost	$20,755,000
Total Recovered from Provinces	4,622,000
Total Paid to Quebec by Canada	620,000

Total Program Costs are the expenditures required to conduct the National Water Management Data Program.

The Total Recovered from Provinces is the amount reimbursed by the provinces, except Quebec, to Canada. These costs are determined according to schedules specified in the Agreement.

The Total Paid to Quebec by Canada is the amount paid by Canada to the Province of Quebec for operating stations of federal interest in that province. These costs are also determined according to schedules specified in the Agreement.

Status: Coordinating Committees, established for each province, convene at least annually but normally more frequently to review the water quantity survey networks and to determine annual cost sharing.

The agreement with Quebec was being amended to make it agree with those in effect with other provinces.

2. PRAIRIE PROVINCES WATER BOARD

Objective: The equitable apportionment of interprovincial prairie waters flowing eastward. The agreement ensures one half the natural eastward flow of waters arising in or flowing through Alberta for Saskatchewan, and one half the eastward flow arising in or flowing through Saskatchewan for Manitoba.

Duration of Agreement: Continuous since October 30, 1969.

Participants and Funding: CANADA
ALBERTA
MANITOBA
SASKATCHEWAN

(Funding to be borne one-half by Canada and one-sixth by each of the provinces.)

Arrangement: Schedule C of the Agreement provides for the reconstitution of the Prairie Provinces Water Board whose responsibility is to oversee and report on apportionment of waters flowing from one province into another province; to take under consideration comprehensive planning, water quality management and other management problems referred to it by the entities concerned; to recommend appropriate action to investigate such matters; and to submit recommendations for resolution of the problems.

Status: The Agreement is administered through the Prairie Provinces Water Board, its five Committees, and its Secretariat.

The Board's Committee on hydrology has recommended procedures for the determination of natural flow and streamflow forecasting for five major interprovincial basins in the area. Natural flows are calculated on an annual basis for five drainage basins. Similar natural flow reports are prepared for other basins straddling provincial boundaries. The Board has approved a Committee report that describes the mechanisms required to administer the 1969 Apportionment Agreement and a report on the apportionment implications of westward flowing streams. The Committee also has submitted a report on westward flowing tributaries of eastward flowing streams and is now developing a workable strategy to deal with interprovincial drainage problems.

At the request of the Board, the Water Quality Branch of Environment Canada reports monthly on water quality at eleven monitoring sites. These stations are part of the basic long-term network proposed by the Board to monitor water quality in the prairie provinces. The Board's Committee on Water Quality is now preparing site specific water quality requirements for each of these eleven stations starting with the Beaver River at the Alberta-Saskatchewan boundary. The Committee, under the direction of the Board, also has established a task force on analytical methodology to provide a means of coordinating water quality laboratory results for the prairie provinces. It also has submitted to the Board a draft report suggesting administrative procedures that could be used in defining, monitoring and administering interprovincial water quality requirements.

The report entitled "Water Demand Study - Historical and Current Water Uses in the Saskatchewan-Nelson Basin" was released to the public on February 10, 1983. That information is now being updated and it is planned to keep the information current and stored in a computerized format for retrieval by interested agencies and individuals.

The Board's Committee on Interjurisdictional Agreements Administration has completed a study of the implications of interprovincial apportionment of water on Mackay and Boxelder Creeks, two streams that border Alberta and Saskatchewan. The report will be forwarded to the Board in the spring of 1984.

The Board established a Committee on Ground Water in the fall of 1980. This Committee is now preparing a report describing a cross-section or profile that defines groundwater conditions along the Alberta-Saskatchewan boundary. The Committee plans to establish and maintain a bibliography of goundwater reports and data related to interprovincia groundwater evaluations. When the profile along the Alberta-Saskatchewan boundary has been completed and published, the Committee plans to prepare a similar report for the Saskatchewan-Manitoba boundary.

The Board also evaluates the effects that proposed projects might have on streamflow in downstream provinces. The results of each such evaluation are reported to the respective ministers of the Board.

3. OTTAWA RIVER REGULATION PLANNING BOARD

Objective: To plan and recommend criteria for regulating the Ottawa River, taking into account hydro-power production, flood protection, navigation, low water problems, water quality needs and recreation.

Duration of Agreement: Continuous since March 1983

Participants: CANADA (3 members)
ONTARIO (2 members)
QUEBEC (2 members)

Canada assumes initial responsibility for financing the cost of the Agreement with Ontario and Quebec each contributing 25%.

Prior Action: As a result of recommendations made following a study of flooding in the Montreal region in 1976, a Canada-Ontario-Quebec Ottawa River Regulation Planning Committee was established in 1977 by an exchange of letters between the federal minister of the Environment, the Quebec minister of the Environment and the Ontario minister of Natural Resources. The final report of the Planning Committee was submitted in December 1980 recommending that a tripartite regulation agreement be negotiated. Negotiations then followed, culminating in the signing on March 2, 1983 of a Canada-Ontario-Quebec Agreement Respecting Ottawa River Basin Regulation.

Arrangement: The Ottawa River Regulation Planning Board administers the agreement. It also formulates and reviews regulation policies and criteria concerning integrated management of the principal reservoirs in the basin.

A regulating committee, composed of operators of the principal reservoirs, is responsible for ongoing operation of the reservoirs, within the guidelines established by the Board.

Status: A secretariat has been established within Environment Canada to act as the excecutive arm of the Board.

During the spring flood period (March 1 - May 30), forecasts on a real-time basis are provided daily for the principal reservoirs in the Ottawa River basin and at selected points where flooding takes place.

The mathematical regulation model is operated on a real-time basis during the spring flood period to serve as a guide to reservoir operations. Additional storage and diversion opportunities are also being analyzed.

4. OTTAWA RIVER WATER QUALITY COORDINATING COMMITTEE

Objective: To review and modify the proposed monitoring plan and oversee its implementation; to undertake or recommend special studies as needed; and to recommend water quality objectives for the river.

Duration of Agreement: Continuous from 1983

Participants: CANADA
QUEBEC
ONTARIO

Prior Action: A Technical Work Group on Water Quality in the Ottawa River was formed in 1980 to study problems related to bacteria and toxic substances in the Ottawa River basin; to identify quantities and sources of nutrients, and to evaluate the importance of agriculture and other diffuse sources of phosphorus. It was hindered from carrying out its mandate by gaps in the data available and, in its report of October 1981, recommended the establishment of a committee to coordinate monitoring, and proposed a monitoring plan to obtain the data needed.

Status: The Coordinating Committee has been set up and a number of meetings were held during 1983-84. An objectives subcommittee was established and is presently preparing an interim report. A revised plan for water monitoring has been adopted.

5. MACKENZIE RIVER BASIN COMMITTEE

Objective: To exchange information on potential water-related developments in the basin and to formulate a program of studies to gather data on the basin's water and related resources.

Duration of Agreement: Continuous since 1973.

Participants: CANADA.....Department of the Environment, Ministry of Transport, Department of Indian and Northern Affairs, Yukon Territory, and Northwest Territories.
ALBERTA
BRITISH COLUMBIA
SASKATCHEWAN

Prior Action: The Mackenzie Basin Intergovernmental Liaison Committee was established in 1973 and reconstituted as the Mackenzie River Basin Committee in a Memorandum of Understanding between the participating governments in May 1977. In May 1978, a $1 600 000 program to study the water and related resources of the basin was endorsed.

The study has been completed and the final report was released by the Ministers on February 26, 1982. The main recommendations call for early negotiations toward a transboundary water management agreement, an expanded network of water data stations, follow-up field studies on ice breakup and a major study of the Mackenzie Delta.

Status: The Mackenzie River Basin Committee continued to meet during 1983-84 to fulfill its liaison responsibilities and to consider study designs, budgets and agreements associated with future implementation of Recommendations 2, 5 and 6. Implementation of Recommendation 1, an agreement through which transboundary water management issues can be addressed, is being pursued outside of the Mackenzie River Basin Committee. Seven bilateral subagreements between the various jurisdictions will precede the development of a master agreement under the Canada Water Act. Bilateral discussions between B.C./Alberta and Alberta/Northwest Territories have been initiated. It is expected that discussions between B.C./Yukon, B.C./ Northwest Territories, Alberta/Saskatchewan and Saskatchewan/ Northwest Territories will be initiated over the next few months.

6. WATER QUALITY MONITORING RELATED TO THE GARRISON DIVERSION PROJECT

Objective: To establish baseline water quality conditions on the Souris River at the International Boundary in both Saskatchewan and Manitoba by means of continuous, automatic monitoring equipment.

Duration of Agreement: Continuous since 1977

Participants: CANADA

Status: Two auto-monitors were operated from 1977 to July 1982. Evaluation of the data with respect to establishing baseline conditions has been undertaken. Work continued on the evaluation of the monitors and preliminary interpretation of data. Discussion has taken place with Manitoba concerning the most appropriate form that future monitoring activities at the International Boundary should take.

7. LAKE OF THE WOODS CONTROL BOARD

Objective: To control and regulate certain major waterways in the Winnipeg River Drainage basin so as to achieve water flow and level conditions that are reasonably acceptable to the various interests.

Duration of Agreement: Continuous. The Board was formed in 1919 under a Dominion Order-in-Council, and was confirmed by federal legislation in 1921 and by Ontario legislation in 1922. At that time, jurisdiction of the natural resources of the four western provinces was vested in Canada,

and therefore the member for Canada acted on behalf of Manitoba. Manitoba gained active membership in 1958.

The Board was established under the Lake of the Woods Control Board Act and is included here only because of its association with other water management programs.

Participants and Funding:

Canada - one member
Ontario - two members
Manitoba - one member

Canada pays one-third of the Board's annual operating costs in the interest of navigation. The remaining two-thirds is paid by Manitoba and Ontario in the proportion of developed hydropower head in the basin in each province.

Arrangements:

The Board fulfills its responsibilities by directing what the outflows of Lake of the Woods and Lac Seul (and at times the flows diverted from Lake St. Joseph) should be.

To assist it in making its decisions, the Board has traditionally maintained a full-time engineering support group in Ottawa within the Inland Waters Directorate of Environment Canada. This group was formally established as the Board's Secretariat with the signing of a Memorandum of Understanding in 1981.

To ensure two-way communications with interests within the basin, the Board has recognized a number of specific interest groups, each of which has appointed an observer to the Board. Groups represented include hydropower utilities, pulp and paper industries, native people, cottage owners and tourist outfitters.

The Board holds public meetings each year in the basin to provide detailed information to the public and to obtain feedback on the effects of levels and flows. Also, the Board maintains a phone-in information service to ensure that the public has ready access to information on current conditions in the basin.

Since the Lake of the Woods is an international boundary water, the federal member of the Board serves as Member for Canada on the International Control Boards for Rainy Lake and Lake of the Woods, to ensure coordination with the United States.

Status:

The Board has a program under way designed to computerize its current methodologies and to introduce new mathematical modelling activities to assist it in its deliberations. The real time hydrometric gauge network in the basin was expanded, and access to additional existing hydrometeorologic stations was obtained.

WATER MANAGEMENT PROGRAMS

1. WINTER RIVER BASIN

Objective: To carry out preliminary data acquisition and assessment of the aquifer hydraulics of the basin. This work will form the basis of subsequent studies to determine the reliability and sensitivity of the existing water supply system for Charlottetown.

Duration of Agreement: April 1984 to March 1987.

Participants:
CANADA
PRINCE EDWARD ISLAND
CITY OF CHARLOTTETOWN

Status: Preplanning studies have been completed and a planning study approved by an exchange of letters. Funding sought from Canada Water Act and MSERD sources was not approved, and the study is being completed under a work-shared arrangement.

2. FRASER RIVER ESTUARY - PHASE II

Objective: To develop a Management Plan for the Fraser River Estuary.

Duration of Agreement: October 1, 1979 to March 31, 1982 (extended).

Participants and Funding:
CANADA.....$290 000
BRITISH COLUMBIA.....$290 000

During 1981-82, the level of funding was raised to $580 000 from $300 000 ($150 000 each).

Prior Action: In February 1977, the federal and British Columbia Environment Ministers authorized a preliminary assessment of the need for this study (Phase I). In August 1978, a Federal-Provincial Steering Committee issued several reports describing the characteristics and prospects of the area and laying out existing policies and practices governing utilization of the estuary. A summary report contained several proposals for the development of a management plan for the estuary.

Phase II of the study produced the report "A Living River by the Door" which describes a proposed management program for the Fraser River Estuary. Subsequently a Review committee was established to obtain public and government comment on the proposed program and to prepare an implementation strategy.

Status: The Implementation Strategy for the Fraser River Estuary Management Plan is under review by both the federal and provincial governments for early action.

3. YUKON RIVER BASIN

Objective: To undertake studies leading to the formulation of a planning framework under which potential development alternatives in the basin may be evaluated.

Duration of Agreement: November 1980 to September 30, 1984 (extended)

Participants and Funding:

CANADA.....	Dept. of the Environment....	$1 100 000
	Dept. of Indian and Northern Affairs.....	$ 880 000
BRITISH COLUMBIA.....		$ 110 000
YUKON TERRITORY.....		$ 110 000
		$2 200 000

Prior Action: Preplanning activities were completed and the Preplanning Task Force's report was submitted in September 1979. The report identified new resource development initiatives in the fields of energy, transportation, mining and recreation, and outlined decisions and studies required to assess alternative uses of water, conflicts and associated impacts.

Status: A three year Canada-British Columbia-Yukon study agreement was signed in November 1980. Its termination date was December 31, 1983. A four member Yukon River Basin Committee was established. In September 1981 a Study Director was hired and a Study Office established in Whitehorse.

Eight work groups were formed to be responsible for Water Quality; Hydrology; Wildlife; Tourism, Parks and Recreation; Fisheries; Energy; Socio-Economic and Placer Mining programs. A Technical Advisory Group composed of the Chairman of the work groups was also established to assist the Basin Committee with preparation of an overall Study Program. Projects reports were completed or neared completion by year end.

Estimated program expenditures to March 31, 1984 are $1,981,000.

4. WABIGOON-ENGLISH MERCURY CONTAMINATION STUDY

Objective: To evaluate methods to reduce high mercury levels in the English-Wabigoon river system in northeastern Ontario. (Work under the agreement focussed on ways in which mercury travels, or is deposited and retained within the river system, as well as methods to reduce the absorption of mercury by fish and other water life.)

Duration of Agreement: June 1978 to June 1980 (extended)

Participants and Funding:

CANADA.....	$150 000
ONTARIO.....	$150 000

Both governments also agreed to undertake related studies outside the agreement, including engineering and economic evaluation of measures selected to reduce mercury contamination, a shoreline study to determine potential sources of clay and a cost estimate for the construction of a dam to raise the level of Clay Lake.

Status: Field studies to determine the dynamics of transport, deposition, and retention of mercury in the Wabigoon-English system have been completed. A number of amelioration techniques have been proposed and reviewed. An interim report on the first year's work was released in July 1980 and both a Summary Report and a Technical Report are scheduled for release in June 1984.

5. WATERFORD RIVER URBAN HYDROLOGY STUDY

Objective: To examine the effects of urbanization on the water resources of the basin, and to develop criteria for urban development which minimize impacts.

Duration of Agreement: 1980-1985

Participants: CANADA
NEWFOUNDLAND

Status: Agreement to proceed with this study was arranged through an exchange of letters between Environment Canada and the Newfoundland Department of Consumer Affairs and Environment early in 1980. Steering and Technical Committees have been formed to administer the program and data collection is ongoing; models have been selected for use in describing and identifying the urbanization impacts on streamflow and water quality; a fully urbanized catch basin has been instrumented for model calibration in the Newfoundland environment; and maps have been prepared to show changes in land use. Most technical reports will be completed in 1984-85.

6. QU'APPELLE BASIN

Objective: To implement recommendations arising from the 1970-1972 Qu'Appelle Basin Study.

Duration of Agreement: April 1974 to March 31, 1984.

Participants and Funding:

CANADA	$18 000 000
SASKATCHEWAN	$15 700 000

An additional $2 000 000 is available on a loan basis from Saskatchewan. CMHC funding infrastructure changes have decreased the loan of $8 400 000 anticipated in the Agreement to about $2 700 000.

In 1981, Treasury Board approved an amendment to the Agreement which allows transfer of funds within the program without affecting total program funding.

Status: The Qu'Appelle Valley Management Board established by the Agreement carried out the implementation programs within the Environmental Improvement and Management, Tourism and Recreation Development, and Implementation sectors. Programs completed include improved sewage treatment facilities at Regina, Moose Jaw and several smaller communities, rural flood prone land purchase, water quality and monitoring research, land use planning and development controls, tourism and recreational

development studies, wildlife management investigations and developments. Other programs completed include flood mitigation projects for Regina, Moose Jaw, Lumsden, Tantallon and some rural portions along the Qu'Appelle River. Pollution control works have been constructed at most of the livestock pollution sources. Completion of the Qu'Appelle River conveyance program, designed to increase channel capacity in severely constricted reaches of the valley will be carried out under a new Canada- Saskatchewan Agreement on Qu'Appelle River channel conveyance.

7. LOWER FRASER VALLEY FLOOD CONTROL

Objectives: To provide protection from flooding of land in the lower reaches of the Fraser River Valley and other areas upstream by rehabilitating existing dykes, constructing new dykes, increasing river bank protection, and improving internal drainage facilities.

Duration of Agreement: 1968 to March 31, 1986 (extended).

Participants and Funding: CANADA.....50%
BRITISH COLUMBIA.....50%

(Local authorities are responsible for providing construction and access right-of-way.)

In 1974, the federal government increased its contribution to the Flood Control Program and Storage Studies from $18 000 000 to $30 500 000 and British Columbia agreed to increase its share by the same amount. In fiscal year 1976-77, both parties agreed to increase the funding to $60 000 000 for each party, and to extend the Agreement to March 31, 1984. In fiscal year 1983-84, the Agreement was extended to December 31, 1986 with no increase in funds.

Status: Construction has been completed at Kent, Matsqui, Surrey (Serpentine-Nicomekl Dams), New Westminster, Coquitlam, Kamloops and Surrey (South Westminster); is approaching completion in Richmond, Pitt Meadow and the Vedder River; and is well advanced in Delta. Construction continued in Abbotsford but is temporarily suspended in Chilliwhack. Estimated expenditures under the program to March 31, 1984 are $107,000,000. The current annual funding rate is $4 000 000 from each government.

8. CANADA-ONTARIO AGREEMENT ON GREAT LAKES WATER QUALITY

Objective: To renew and strengthen cooperation between Canada and Ontario in meeting the obligations under the revised 1978 Canada-U.S. Agreement and to provide for cost-sharing of specific programs which the province will undertake with the federal government in meeting these obligations.

Duration of Agreement: August 1971 to March 31, 1985; agreement renewed in 1976 and 1982

An initial agreement from August 1971 to December 31, 1975 authorized $3 million for feasibility studies and joint sewage treatment technology and

urban drainage research. Loans totalling $250 million for sewage treatment facilities from CMHC and the Ontario Government were also called for in the initial agreement. (Funding for municipal sewage treatment between 1976 and the signing of the new agreement in 1982 was the subject of a separate agreement with CMHC under the National Housing Act.)

The agreement was renewed in March 1976, retroactive to 1 January 1976, as a basis for establishing joint water quality objectives, and to serve to coordinate and implement federal and provincial input to Canadian responsibilities under the international agreement, and to conduct research. This agreement expired on March 31, 1980 but, because a revised agreement was then under negotiation, the 1976 agreement was extended to March 31, 1982, through exchanges of letters between ministers.

The agreement was renewed again in July 1982, retroactive to April 1, 1982.

Participants and Funding: CANADA
ONTARIO

The participants each pay half the cost associated with the research and surveillance programs. For each fiscal year, the total amount payable by Canada shall not exceed an amount to be agreed upon between Canada and Ontario, taking into account:

(a) the recommendations made by the International Joint Commission respecting surveillance of the whole of the boundary waters;

(b) the decisions taken, as a result of such recommendations, by the parties to the Canada-U.S. Agreement with respect to such surveillance;

(c) the recommendations of the Board of Review.

The federal share in fiscal year 1983-84 was set so as to not exceed $1 200 000 and was entirely allocated to surveillance and information programs.

A further $65 million is being made available to Ontario for the period 1982-1985 to assist in the completion of municipal sewerage facilities construction to meet the requirements of the Canada-U.S. Agreement. This extra funding was formalized under the 1982 Canada-Ontario Agreement.

The principle of work-sharing was introduced into the new agreement to effect better coordination of federal-provincial activities to meet program requirements of the international agreement.

Status: In February 1981, a joint Canada-U.S. team of scientists began a comprehensive investigation of toxic chemicals in the Niagara River. This joint investigation will make recommendations as to what should be done to reduce or remove the contamination and to monitor the effectiveness of clean-up programs. The final report on this investigation is expected to be released to the agencies late in the spring of 1984.

The 1982-83 Annual Report of the Review Board for the Agreement was submitted to the respective parties to the Agreement.

Because, as already noted, the Canada-Ontario Agreement is being undertaken to provide a basis for implementing the Canada-U.S. Agreement on Great Lakes Water Quality, a brief outline of activities under the latter agreement is also provided.

CANADA-U.S. AGREEMENT ON GREAT LAKES WATER QUALITY

Objective: To improve the quality of the water in the areas of the Great Lakes now suffering from pollution; to ensure that Great Lakes water quality will be protected in the future; and to restore and maintain the chemical, physical and biological integrity of the waters of the Great Lakes Basin Ecosystem.

Duration of Agreement: Continuous since April 1972; revised Agreement signed November 22, 1978.

Participants: CANADA
UNITED STATES

Commitment: The concept of the Great Lakes basin and its human resources as an ecosystem is explicitly recognized in the new Agreement. Numerical water quality objectives for some 40 compounds have been specified. Approximately 99 percent of the sewered population on the Canadian side of the basin is now served by adequate municipal wastewater treatment facilities. Programs to control and prevent pollution from industrial sources entering the Great Lakes System have been designated and are being implemented. A commitment has been made to eliminate the discharge of toxic substances into the Great Lakes. New interim phosphorus loading targets, defined for each lake, are designed to achieve desirable levels of water quality. Binational negotiations to ratify the loading targets and reach agreement on Canadian and U.S. programs to meet these targets were partially completed in 1983.

Arrangement: The International Joint Commission was given primary responsibility for overseeing implementation of this international water quality Agreement. The Commission has established a number of Boards and Committees to carry out the various provisions of the Agreement. Activities are carried out under four programs: Objectives Development, Controls, Assessment, and Special Projects (including toxics, eutrophication, health hazards, etc.).

Status: Canada and Ontario have agreed to proceed with the implementation of a Phosphorus Control Supplement as recommended under Annex III of the 1978 Agreement. The Control Supplement agreed to on October 16, 1983 includes measures to both protect the upper Great Lakes and further reduce phosphorus discharges to the lower Great Lakes. The Agreement ratifies the phosphorus loading targets and allocates the residual load reductions to Lake Erie between the United States and Canada. Negotiations continue to similarly allocate the load reductions to Lake Ontario.

In November 1983, the Water Quality Board submitted its report to the IJC under the terms of the 1978 Canada-U.S. Great Lakes Water Quality Agreement. This report focussed on the environmental quality of the Great Lakes Basin Ecosystem. In particular, the report focussed on an update of the 18 Class "A" areas of concern identified by the Board in its 1982

report and the adequacy of existing remedial programs in addressing the pollution issues identified in the areas. The meeting at which the Board's report was submitted was set up differently than those of earlier years to strenghten the public interaction between the Commission and its Boards.

Under the surveillance program four intensive surveillance cruises of Lake Superior and three regular surveillance cruises of Lake Ontario were carried out as part of the Great Lakes International Surveillance Plan (GLISP). A total of 114 sampling sites on Lake Superior and 94 points on Lake Ontario were sampled during each cruise. Daily sampling at Niagara-on-the-Lake and at Wolfe Island in the St. Lawrence River, was completed. A new sampling site was put in place at Fort Erie. This year (1983) was the intensive year for surveillance of Lake Superior as well as the last of the nine-year rotational cycle of intensive surveys on each of the Great Lakes under the GLISP. This plan is now being updated and modified by a number of Lake and Connecting Channel Task Forces in light of information collected over the past nine years.

9. SOURIS BASIN

Canada/Saskatchewan Interim Subsidiary Agreement on Water Development for Regional Economic Expansion and Drought Proofing.

Objective:

To implement the framework plan for the management of the water and related resources of the basin arising from the 1974-1978 Souris Basin Study. Environment Canada's participation has been to implement flood damage reduction measures recommended in the Souris River Basin Study.

Participants:

CANADA
SASKATCHEWAN
MANITOBA

Prior Action:

The Souris River Basin Board report, containing a main report and nine supplements, was jointly released by Canada, Saskatchewan and Manitoba on August 25, 1978. An Advisory Committee on Implementation of the Joint Canada-Manitoba- Saskatchewan Consultative Committees, and a Souris River Study Implementation Working Group were established.

Status:

The Advisory Committee on Implementation suggested that the majority of the recommendations could be undertaken under existing federal programs, provincial programs, federal-provincial agreements and proposed federal-provincial agreements. A number of recommendations have been covered under the SAW Agreement and the Canada-Manitoba Interim Agreement on Water. The SAW agreement expired on March 31, 1984. Vitually no federal funds were spent under the Flood Damage Reduction Sector of the agreement because identified flood hazard areas were not designated, nor were appropriate zoning or land use regulations implemented as required. Joint federal-provincial designations have been curtailed by Saskatchewan pending the outcome of a review of the Flood Damage Reduction Program. Federal and federal/provincial water management activities and work on water supply projects are continuing under Agriculture Canada (and formerly DREE) and provincial funding.

10. MERCURY IN THE CHURCHILL RIVER DIVERSION SYSTEM

Objective: To determine the degree to which mercury is present in the Churchill River Diversion system and to identify sources; to study pathways and mechanisms by which mercury moves from water to fish and wildlife through the food chain; to monitor the concentration of mercury in aquatic plants and fish and compare it with available data on the presence of mercury in people living in this area and; where possible, suggest remedies to local mercury problems and means of predicting future occurrences of mercury contamination.

Duration of Agreement: March 1983 to December 1986

Participants and Funding:

CANADA	$380 000
MANITOBA	$380 000

Background: This study arose from concern over increased levels of mercury in fish along the diversion route. Area soils and mineral deposits contain background levels of inorganic mercury, which may have been released when the area was flooded. This problem was first addressed under the Northern Flood Agreement that the Department of Indian and Northern Affairs negotiated on behalf of Canada in 1977-78 between Canada, the Province, Manitoba Hydro and the Northern Flood committee (a collectivity of various Indian Bands). An arbitrator, appointed in March 1980 under the terms of the Northern Flood Agreement, to arbitrate claims from any of the four parties concerned, identified the mercury agreement as a priority federal-provincial responsibility.

The Canada-Manitoba Agreement on the Study and Monitoring of Mercury in the Churchill River Diversion was signed on March 10, 1983. The Agreement allows for cost-sharing of expenditures made by Canada and Manitoba retroactive to April 1, 1982. The four year Agreement is scientific in nature and has five broad objectives aimed at improving the knowledge and the ability to respond to mercury problems in northern Manitoba.

Status: Work under this Agreement has progressed well to date with nine of the possible 14 projects underway. A four person Steering Committee and eight person Technical Advisory Committee have been appointed with an equal number of federal and provincial members. A Study Director has been hired to provide the necessary management support, coordination of projects and information, and to develop the public awareness component of the Agreement.

11. CANADA-ONTARIO SPECIAL RECOVERY CAPITAL PROJECTS

Objective: To provide for federal financial contributions to Ontario for water supply and sewage treatment projects which will help stimulate economic and regional development and which put more modern and efficient public capital projects at the service of Canadian Communities in anticipation of economic recovery.

Duration of Agreement: December 1983 to March 1985.

Participants and Funding: CANADA.....$8,500,000
ONTARIO AND MUNICIPALITIES...$8,500,000

Background: The Special Recovery Capital Projects Program is a federal initiative announced by the Finance Minister in his budget address of April 19, 1983. The Programs goal is stimulation of the economy by providing contributions to capital projects which would otherwise be constructed at a much later date.

Status: Planning is underway for a secondary sewage treatment plant at Niagara Falls. Work is proceeding on water delivery and treatment systems and sewers at Sudbury and Timmins.

12. NORTH SHORE RIVERS ECOLOGICAL INVENTORIES PROGRAM

Objective: To conduct joint ecological studies of rivers flowing into the St. Lawrence River from its north shore in order to facilitate future assessments of ecological impacts from major developments.

Duration of Agreement: April 1978 to September 1983 (extended)

Participants and Funding: CANADA.....$1 220 000
QUEBEC.....$1 220 000

Status: Final Reports on studies and geophysical inventories were continued during the year under review and the final report of the Committee was completed in September 1983.

FLOOD DAMAGE REDUCTION PROGRAM

1. FLOOD MANAGEMENT - MARSH CREEK, N.B.

Objective: To reduce the damage from floods in the Marsh Creek Watershed through acquisition of lands, construction of a flood control reservoir, channel improvements, excavations and changes in structures.

Duration of Agreement: September 1977 to March 1984 (extended).

Participants and Funding: CANADA.....$670 000
NEW BRUNSWICK.....$670 000
CITY OF SAINT JOHN....$670 000

Prior Action: Studies conducted under the Canada-New Brunswick General Agreement Respecting Flood Damage Reduction contained recommendations for appropriate measures to reduce flood damages in the watershed. Some reservoirs and all channelization work, as well as reconstruction of Marsh Bridge, have been completed. Indications are that expropriation of the forebay may not take place.

Status: A consultants study, which focusses on the works constructed to date, is nearing completion and is expected to define the current level of flood protection afforded by the construction works, and to identify the impacts associated with infilling of the forebay.

2. FLOOD DAMAGE REDUCTION WORK AND DYKES - MONTREAL REGION

Objective: To plan and construct dykes to prevent flood damage in the municipalities of Pointe-Calumet, Sainte-Marthe-sur-le-Lac, Roxboro, Pierrefonds and Châteauguay; and to determine the feasibility of enlarging the storage capacity in the upper Ottawa River basin, and of reducing the maximum flow of Rivière des Mille Iles to approximately 700 cubic metres per second by means of a control structure.

Duration of Agreement: June 1981 to March 1984.

Participants and Funding:
CANADA.....45%
QUEBEC.....55%

Under the Agreement Respecting Dykes and Flow Regulation Works in the Montreal Region, signed in October 1976, total funding was doubled from $5 million to $10 million in October 1977, and was increased in March 1980 to $11 556 000. Further funding in the amount of $4 500 000 is provided under the new agreement signed on June 26, 1981.

Prior Action: Between June 1974 and October 1976, a study was conducted to determine the means of reducing the frequency of both flooding and extreme low water levels in the Montreal Region water bodies. The Committee on Flow Regulation, Montreal Region, which conducted the study, submitted an interim report in 1975 and its final report in October 1976. The first implementation agreement was signed in October 1976 on the basis of the recommendations in the interim report, because the extensive damage caused by floods in 1974 and 1976 in the Montreal Region made it important that these recommendations be implemented immediately.

Status: Construction of dykes at Roxboro, Pierrefonds, Pointe-Calumet, Châteauguay and Sainte-Marthe-sur-le-lac was completed. Studies to determine the feasibility of a control structure on the Rivière des Mille Iles also were completed. Following a series of provincial public hearings concerning additional storage capacity in the Quinze Reservoir, the province has indicated that it does not wish to pursue the option of increasing storage in that reservoir.

3. UPGRADING RING DYKES - RED RIVER VALLEY

Objective: To increase the level of protection afforded by ring dykes in the communities of Rosenort, Morris, St. Adolphe, Dominion City, Emerson, St. Jean Baptiste, Letellier and Brunkild.

Duration: Three years

Participants and Funding:
CANADA.....$2 025 000
MANITOBA.....$2 475 000

Additional funding of $1,600,000 will be required for proposed works at Ste-Rose-du-Lac and Souris.

Prior Action: Between 1967 and 1971 Canada and Manitoba cooperated in the construction of dykes around seven Red River basin towns that had suffered damages during the 1950 flood and again in 1966. Subsequent experience demonstrated, most recently in 1979, that the dykes constructed under the 1967 agreement did not provide a sufficient margin of safety, nor did they meet the standards of the Canada-Manitoba Flood Damage Reduction Agreement signed in 1976. Thus, a new agreement was signed on March 10, 1983 to upgrade the seven ring dykes which were jointly built earlier, as well as an eighth dyke, around Brunkild, which had been built and fully paid for by Manitoba.

Status: An agreement was signed on March 10, 1983, and a committee was being formed to administer the agreement. Construction was initiated at St. Adolphe and Brunkild. Negotiations were completed to add the construction of a dyke at Ste-Rose-du-Lac and the upgrading of a dyke at Souris through an amended agreement.

4. MILLE ILES FLOOD CONTROL STRUCTURE

Objective: To reduce the level of flood damage along the Rivière des Mille Iles in Montreal Region.

Duration: December 1983 to March 1987.

Participants and Funding:

CANADA.....	$5.9 million
QUEBEC.....	$7.2 million

Prior Action: Studies to determine the feasibility of a flood control structure on the Rivière des Mille Iles were conducted under the Agreement Respecting Dykes and Flow Regulation Works - Montreal Region.

Status: The Canada-Quebec Agreement was signed on December 10, 1983, and the Steering Committee for the project was established.