ANNUAL REPORT 1978

INLAND WATERS DIRECTORATE ONTARIO REGION

DEPARTMENT OF THE ENVIRONMENT

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1.0 Introduction

Inland Waters Directorate (IWD), Ontario Region, is a component of the federal Department of the Environment. The lead federal agency for water management in the Ontario Region, IWD plans and participates in national and international water management programs for maximum economic and social benefits, giving full consideration to environmental concerns.

The primary role of the Directorate is related to the gathering and dissemination of water related information and to explaining and predicting the behaviour of the quantity and quality of the waters in Ontario with particular emphasis on the Great Lakes and their connecting channels. It plays a major role in water use planning and management investigations including Great Lakes shoreland management and flood damage reduction programs in cooperation with the province, and in addressing international water management problems along the Canada-U.S. boundary. In addition, the Directorate has a research role in relating water management policies and programs to social needs and issues.

In dealing with the problems of water quality and quantity in the Great Lakes and connecting channels, the Directorate provides extensive support to the International Joint Commission (IJC) through staff membership and participation on its Boards, Working Groups, and Committees. The IJC was established by the Boundary Waters Treaty of 1909 to oversee all boundary water issues between Canada and the United States. The IJC is responsible for assisting the two countries in the implementation of the Canada-U.S. Great Lakes Water Quality Agreement first signed in 1972 and renewed in 1978. The Canada-Ontario Great Lakes Water Quality Agreement signed in 1971 provided the instrument for the cooperation of Canada and Ontario in clean-up efforts on the Canadian side of the Great Lakes.

The Canada Water Act, proclaimed on September 30, 1970, provides for the federal role in managing Canada's water resources. Under this legislation, IWD, Ontario Region works with the Province of Ontario through implementation agreements such as that for Southwestern Ontario Agricultural Land Dyking, planning studies such as the Canada-Ontario Great Lakes Shore Damage Survey and other co-operative arrangements such as the Federal-Provincial Cost Share Agreement on Water Quantity Surveys signed on June 16, 1975 with Ontario.

The Directorate consists of three Branches and one Division: Water Planning and Management Branch; Water Resources Branch; Water Quality Branch; and Policy Research and Social Analysis Division.

The Water Planning and Management Branch (WP&M) administers and implements federal, federal-provincial, and international water management projects. The Branch provides technical support to all the International Joint Commission's Great Lakes' Boards of Control; carries out special studies for IJC Study Boards as per the current Lake Erie Regulation and Great Lakes Diversions and Consumptive Uses Studies; implements federal-provincial water management projects under the Canada Water Act relating to flood damage reduction, flood control, and shoreline management; and reviews federally-initiated and federally-funded water related projects for environmental impact under the Environmental Assessment and Review Process.

The Water Resources Branch (WRB) operates and maintains a network of stream-flow, water level, and sediment stations throughout Ontario and the Great Lakes system jointly funded with the Province; publishes annual summaries of the data collected; and provides more detailed water quantity information for specific projects and programs in the region such as special requests from various IJC Boards of Control for additional field projects involving interconnecting channels.

The Water Quality Branch (WQB) carries out monitoring and surveillance activities in the Great Lakes and connecting channels; maintains an analytical laboratory supporting programs of the Directorate and other Departmental components in the region; and provides a quality control and methods development service to Water Quality Branch laboratories across Canada.

The Policy Research and Social Analysis Division (PR&SA) provides advice to the Director and branches of Inland Waters Directorate, Ontario Region on program planning and evaluation; gathers and evaluates social and institutional information; and researches the socio-economic implications of resource policies and programs. Much of the Division's activities are related to IJC Boards, References, and Studies.

The activities of the Directorate are divided amongst comprehensive regional programs each of which is directed by a lead agency and may utilize resources and expertise from any of the branches of Inland Waters Directorate or other components of the Department of Environment. The following is a description of the activities carried out within this program structure during 1978.

2.0 Great Lakes and St. Lawrence River Basin Water Level Control Program

The variations of the Water levels and flows in the Great Lakes and their connecting channels have been recognized by the Governments of Canada and the United States as an important boundary issue. The natural ecosystem and activities of man in the region are all affected by water level fluctuations in the Great Lakes and their connecting channels. The various interests in the basin often have different desirable ranges of water levels and flow. For example, shore property interests would generally benefit most by the stabilization of water levels and reduction of the extremes of both high and low levels. Navigation is best served by higher lake levels while hydroelectric power interests prefer the maintenance of minimum flows as large as possible, particularly during periods of high demands for power. Thus, there are benefits and costs associated with any given water level. The International Joint Commission (IJC) was established in 1909 to seek common solutions in the joint interest and in accordance with the agreed rules or principles set out in the Boundary Waters Treaty. This has since led to several international agreements between Canada and the United States regarding activities that affect the levels and flows in the Great Lakes-St. Lawrence River system.

The Inland Waters Directorate, Ontario Region provides advice and assistance to the IJC and other bilateral entities in carrying out the terms of the various agreements between the two countries.

2.1 Great Lakes Boards of Control

The Directorate continued to support the IJC's International Lake Superior and St. Lawrence River Boards of Control in regulating the outflows from Lakes Superior and Ontario. The levels of Lake Superior were slightly above normal in early 1978. Commencing in April, below-normal water supplies to the lake kept the lake level slightly below normal for the remainder of the year. Lake Ontario levels were above normal for the first half of the year but dropped to below normal from mid-August to the end of the year. On the unregulated lakes (Lakes Michigan, Huron, St. Clair and Erie), the water levels remained above their long-term means throughout the year.

Technical support was provided to the Commission's International Niagara Board of Control regarding water control and monitoring activities in the Lake Erie-Niagara River area, including monitoring the operation of the Lake Erie-Niagara River Ice Boom and carrying out related studies. Public meetings on the operation of the ice boom are held annually. The Directorate also assisted the International Niagara Committee, established by the Governments of Canada and the United States pursuant to the Niagara Treaty of 1950, in determining the amounts of water available and the amounts used for various purposes of the Treaty. Following the relocation of the American Falls Channel Gauge in 1976, IWD undertook a study to evaluate the proportion of total Niagara Falls flow which passes over the American Falls. A report on this study was completed in 1978, showing that the present gauge site is satisfactory. The report also points out that the performance of the Niagara remedial work project is generally as predicted by model tests carried out in the 1950's.

During 1978, WP&M provided support to the IJC in conducting public hearings regarding the new Lake Superior regulation plan and on considerations for changing the existing IJC Orders of Approval in order to implement this plan. The new plan, called Plan 1977, considers both the levels of Lake Superior and Lake Huron in determining the outflows of Lake Superior. The Branch also provided extensive support to the IJC and the Lake Superior Board with regard to the proposal by the Great Lakes Power Company to redevelop its power plant facilities at Sault Ste. Marie, Ontario in order to better utilize the Canadian share of St. Marys River stream-flow. Technical support was provided to Acres Consulting Services, in their study of levels and flows on behalf of the Great Lakes Power Company.

Other water management activities carried out by WP&M included monitoring the operation of the ice booms in the St. Marys and St. Lawrence Rivers, monitoring the Chicago diversion and participating in related studies, and participating in a study of the feasibility of protective measures for the Lake Superior Compensative Works.

International efforts to extend the navigation season in the Great Lakes-St. Lawrence River system continued to require the Branch's attention. WP&M represents IWD, Ontario Region on the Canadian Winter Navigation Extension Committee which has funded and reviewed a study on the economic implications for Canada of extended navigation. The Committee's recommendations have been forwarded to Transport Canada and the St. Lawrence Seaway Authority.

2.2 Great Lakes Study Boards

In May, 1977, the IJC, at the request of the Governments of Canada and the United States, established: (a) the International Lake Erie Regulation Study Board to determine the practicability of limited Lake Erie regulation; and (b) the International Great Lakes Diversion and Consumptive Uses Study Board to examine the effects on Great Lakes water levels and flows, of existing and proposed diversions and consumptive uses in the watershed. The Water Planning and Management Branch, Ontario Region, and its Headquarters in Ottawa provided extensive support to these two reference studies during 1978.

The Lake Erie study organization consists of the Board, a Working Committee, and seven subcommittees to deal with the specific studies related to regulation, regulatory works, power, navigation, coastal zone, environmental effects, and economics. Inland Waters Directorate, Ontario Region, provides the Canadian Chairmen and secretaries to the Study Board and the Working Committee and par-

ticipates extensively in the activities of the subcommittees. The Special Advisor for IJC Obligations and Research, IWD, Ontario Region is the Study Coordinator for the Lake Erie Regulation Study. He reports to both the Canadian and U.S. Chairmen of the Study Board and assists the Chairmen of the Working Committee in coordinating the study efforts.

Considerable progress had been made in the Lake Erie Study by the end of the year. The Working Committee prepared a proposed program for public information and involvement, which will be implemented in 1979. The Regulation Subcommittee developed the levels and flows under the basis of comparison, with which levels and flows under all other Lake Erie regulation plans will be compared. It has also developed a series of Lake Erie regulation plans. These plans would require the use of the proposed Niagara River structure or the Black Rock Canal and Squaw Island diversion channel to discharge additional Lake Erie outflows.

The Regulatory Works Subcommittee has prepared preliminary engineering designs and cost estimates for regulatory work at the head of the Niagara River and preliminary cost estimates for regulatory/remedial works in the St. Lawrence River.

The Coastal Zone Subcommittee co-chaired by a WP&M staff member developed methodologies for evaluating the effects of proposed regulation plans on shoreline flooding and erosion. It also analyzed and compiled shoreline property data for all flood- and erosion-prone areas on the Great Lakes shoreline. PR&SA prepared two study papers for the Subcommittee on shoreline development policies in Ontario and recreation in the Great Lakes Basin. The Subcommittee will be evaluating the effects of increased consumptive use of water and various diversion schemes for the Diversion and Consumptive Uses Study Board.

The Environmental Effects Subcommittee chairman and secretary are staff of WP&M. The Subcommittee has established five disciplinary groups in the areas of fisheries, wildlife, water quality, recreational beaches and recreational boating. A plan of action has been prepared and information gathering has progressed in all areas except recreational boating. Studies in the latter area will be done by contract in 1979. Reports have been prepared on the methodologies to be used in the evaluation of the impacts of lake level regulation. WP&M has been extensively involved in leading the evaluation on water quality effects.

A PR&SA staff member co-chaired the Ad Hoc Economics Subcommittee which provided economic guidelines for the use of the other subcommittees working in the Lake Erie study. Two study papers were prepared by PR&SA for the Economics Subcommittee: "Comments on Shoreline Damage Data" and "Comments on the Use of Updated Generalized Loss Curves for Shoreline Property Based on the IGLLB Methodology". It was found that in general the Canadian shore damage data was good since it was valued by an independant third party while the U.S. data was questionable and required validation since it was based on a self-administered questionnaire.

WP&M contributes to the International Diversion and Consumptive Uses Study Board by providing the Canadian Co-chairman for the Diversions Subcommittee and by serving in an advisory role to the Study Board.

2.3 Great Lakes and Interconnecting Channel and Water Levels Monitoring

The Water Resources Branch operates and maintains for the Canadian Hydrographic Service thirty-nine water level stations on the Great Lakes and downstream on the St. Lawrence River as far as Summerstown. The continuing review of network station requirements resulted in the discontinuation of two stations on Lake Ontario at Oshawa and Point Petre. Metric conversion of all water level instrumentation was completed. The existing bench mark networks used for levelling purposes at each station were reviewed. As a result, several bench marks were installed and several others were discontinued in order to reduce long level line circuits and eliminate unstable bench marks. A newly developed water level recorder, known as "Data Acquisition and Telemetry System" (DATS), was installed at four stations. The DATS Recorder has a solid-state digital memory for temporary storage of water level data at the gauge site. It is anticipated that this recorder will replace the Telex gauging system presently used at thirteen sites.

Personnel from WRB and the Detroit District U.S. Army Corps of Engineers undertook a joint discharge measurement program on the Niagara River below the Ashland Avenue gauge. During the week of November 6-10, 1978, ten discharge measurements in the range of 53,100 to 67,200 cfs were taken from the Robert Moses cableway located in the lower Niagara River. The data were required to verify the stage-discharge relationship of the Ashland Avenue gauge which defines the flow passing over the Niagara Falls and out of the Maid-of-the-Mist Pool.

3.0 Great Lakes Basin Water Pollution Program

The Great Lakes represent 80% of the North Americans' supply of surface fresh water. They sustain life, commerce, industry, and recreation for an estimated 35 million North Americans. One out of every three Canadians live in the basin and one-half of all manufactured goods of the country are generated there. The major urban centres of the basin are situated adjacent to the Great Lakes and rely on them for a ready source of water for domestic and industrial use and as assimilators of their wastes. The Great Lakes are thus a priceless resource of vital importance to all facets of life and activity in the Great Lakes basin. The quality of their waters - their freedom from pollution - is a basic concern to Canada and the Ontario region in particular.

On April 15, 1972, the Canadian and U.S. governments signed the Great Lakes Water Quality Agreement which formalized the intent on behalf of both countries to pre-

vent further deterioration of the Great Lakes and provided the basis for improving existing water quality. This intent was reaffirmed by the signing of a new agreement on November 22, 1978. The new Great Lakes Water Quality Agreement emphasizes pollution from toxic substances and the control and prevention of pollution from industrial sources. Numerical water quality objectives for some 40 compounds have been specified in the new Agreement. The IJC has been given the responsibility to assist the two governments in the implementation of the Agreement. IWD provides extensive membership and scientific support to the IJC's Boards and Committees responsible for the implementation of the Agreement.

Inland Waters Directorate activities related to the Agreement include;

a) the defining and continual refining of water quality objectives;
b) providing advice on control policies and measures;
c) monitoring and surveillance of loadings to the lakes, conditions in the lakes, and lake related activities to ensure the water quality objectives are being met and to determine the effectiveness of remedial measures; and
d) identifying new and developing pollution problems.

Within Canada, the Federal and Provincial governments signed the Canada-Ontario Agreement on Great Lakes Water Quality in 1971 which was extended in 1976 for a further five years. This Agreement provides the instrument for the cooperation of the two jurisdictions in clean-up efforts in the Great Lakes and for Ontario's coordination and cooperation with government agencies in the United States.

The Agreement also provides for the cost-sharing of provincial surveillance activities on a 50-50 basis. In the 1977-78 fiscal year Canada's share of surveillance costs under the Canada-Ontario Agreement amounted to $678,414.

3.1 Canada-U.S. Open Lake Surveillance and Analysis

In 1978, the Water Quality Branch continued in its lead role in conducting the operational aspects of the open lakes surveillance project. This activity includes identifying areas where the water quality objectives of the Canada-U.S. Great Lakes Water Quality Agreement are being violated, assessing how the lakes are responding to remedial programs aimed at improving the quality of municipal and industrial discharges, identifying trends in water quality, and detecting emerging problems.

WQB participated in sixteen water quality survey cruises carried out on the Great Lakes during the year. Nine of these cruises, each of which involved the sampling of 94 stations were conducted in Lake Ontario and took place in the period between March 20 and November 17. A total of 1401 samples were analyzed on board ship for 4193 tests and an additional 2976 samples were analyzed in the main laboratory at CCIW for 20,740 tests. One hundred and three stations were sampled during each of seven cruises on Lake Erie between May 29 and October 6 in support of special studies conducted by the National Water Research Institute at CCIW. A total of 3301 samples were analyzed on board ship for 9903 tests and 3993 samples were analyzed in the main laboratory for 27,317 tests.

WQB staff, using data from the surveillance program, completed data analysis and interpretation for the IJC Surveillance Subcommittee Annual Report. WQB provided extensive support to the IJC Surveillance Subcommittee by serving as chairmen of the Subcommittee and of the Lake Huron and Lake Superior Working Groups and contributing input to the Lake Ontario and Atmospheric Working Groups. Two reports were prepared on the chemical limnology of Georgian Bay and the North Channel respectively.

3.2 Atmospheric Loadings

As part of the IWD's commitment to IJC Great Lakes Surveillance, the precipitation sampling network on the Canadian side was expanded to fifteen stations. Through the participation of WQB staff on the Nanticoke Environmental Technical Committee an agreement was reached whereby a sampler at Long Point is maintained by Ontario Ministry of the Environment personnel. Of the fifteen stations in the network, seven are equipped with automatic precipitation samplers, four have bulk samplers only and the remaining four are equipped with both types to permit intercomparison of the two sampling modes. During the year the manufacturer's original design of the automatic precipitation sampler was revised in accordance with recommendations from WQB staff. All the automatic samplers in the field were modified to incorporate these improvements. Atmospheric loading estimates to the Great Lakes were reported to the IJC Surveillance Subcommittee.

3.3 Analytical Laboratory Support

Analytical support services were provided by WQB to over 50 studies and projects related to programs of the federal government, the IJC and other agencies. A total of 30,000 samples consisting of water, wastewater, precipitation, sediments, fish and other aquatic biota were analyzed for over 173,000 tests.

3.4 Connecting Channels Water Quality

Water quality monitoring and surveillance activities on two connecting channels, the Niagara and St. Lawrence Rivers, were continued during the year. Automatic water samplers at Niagara-on-the-Lake and Wolfe Island on the St. Lawrence collected samples daily to determine chemical loadings into and out of Lake Ontario. Loading estimates were provided to the IJC Surveillance Subcommittee. WQB staff also prepared the plan for connecting channels surveillance in the 1979 field season.

Suspended sediment samples were collected bi-weekly from the Niagara River to identify persistent contaminants in the aquatic environment. In spite of some difficult anal-

ytical problems, results were obtained and their value in identifying potentially hazardous situations in the environment is becoming increasingly apparent. A report entitled "Short Term Variation of the Chemical Composition of the Niagara River" was completed and two others for the St. Lawrence and Niagara Rivers are underway.

3.5 Socio-Economic Studies and Modelling

A survey of the public's perception of Great Lakes water quality was performed by the Policy Research and Social Analysis Division for the IJC's Water Quality Board Annual Report. It indicated that the public generally perceive a change for the better in Great Lakes water quality. It also indicated that the public is not very aware of what government agencies are doing to protect water quality and is generally displeased with governmental efforts in this area.

3.6 International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG)

An evaluation of the social and economic benefits of the existing phosphorus control programme in the Great Lakes is currently underway. This is the first step in evaluating the potential cost effectiveness of the various PLUARG recommendations prior to initiating implementation of them.

3.7 International and Interprovincial Rivers

The Water Quality Branch in cooperation with Environmental Protection Service and the National Capital Commission began a water quality study on the Ottawa River this year. The two principal objectives of the study are to determine the existing water quality in the river and to assess the effects of the Outaouais sewage collection and treatment system on the water quality of the river.

A pilot study sampling at twenty-one stations was conducted to assess the variability of the system and identify the major factors influencing water quality in the study area. Based on the findings of this study, a strategy for future monitoring of the river will be developed.

4.0 Great Lakes Shoreland Management and Damage Reduction Program

High water levels and storms have resulted in considerable flood and erosion damage in recent years along much of the lower Great Lakes shoreland. As a result of this damage, Canada and Ontario carried out a major survey of the shoreline in 1973-74 to assess the nature and extent of the damage and to recommend remedial measures. In 1976, the Technical Report of the Canada-Ontario Great Lakes Shore Damage Survey was released. This report contained a number of recommendations for follow-up programs on the Great Lakes to reduce future shore property damage. The principal recommendations were for a public awareness program to better inform the public of the risks of building near the shore, a program to identify hazardous areas, and the development of shoreline management strategies to reduce future damages through land use controls, land acquisition, and, where warranted, effective shore protection.

Following the release of that report, Canada and Ontario established a Task Force to implement these recommendations. The Water Planning and Management Branch, along with Ocean and Aquatic Sciences of the Department of Fisheries and Oceans and the Ontario Ministry of Natural Resources, has been carrying out a number of follow-up programs initiated by this Task Force.

4.1 Great Lakes Shoreland Hazard Mapping

In early 1978, maps showing flood- and erosion-prone areas near the Great Lakes shoreland were completed. The maps were produced on both a 1:10,000 and 1:20,000 scale and cover the shoreline from Sauble Beach on Lake Huron to Gananoque on the St. Lawrence River. A Guide was also published, describing how to use the information on the maps. The maps and Guide have been distributed to all shoreland municipalities and Conservation Authorities for their use in developing Official Plans, zoning by-laws, and flood and fill line regulations. Copies of the maps and Guide have also been sold to the general public.

4.2 Public Awareness of Great Lakes Shoreland Problems

WP&M provided funds and technical support to a federal-provincial program to make the public more aware of the problems of living in the shore zone. A pamphlet on shoreland problems and related government programs was prepared and mailed directly to most shoreland residents on the Great Lakes. A brochure entitled "Shore Property Hazards", intended as a guide for present and potential shoreland residents, was also prepared and will be distributed to the public in early 1979. A third publication on water level regulation entitled "Not Ours to Control" was also produced and made available to the general public.

A Canada-Ontario display on the federal/provincial shoreline management program on the Great Lakes was shown at the Poster Session of the Canadian Council of Resource and Environmental Ministers Shore Management Symposium held in Victoria, B.C., October 3-6, 1978. The display entitled "Coping With the Great Lakes", graphically described the programs that have been undertaken by the two governments on the Great Lakes' shore. The display was manned during the symposium by a WP&M staff member as well as representatives from the Province and from Ocean and Aquatic Sciences.

4.3 Great Lakes Shoreland Monitoring

Inland Waters Directorate continued to provide federal funding for the five-year Canada-Ontario shoreland moni-

toring program. The objective of this program is to provide the basic data needed to increase our understanding of shore processes in the Great Lakes. Shoreland conditions are monitored at 162 locations on the Great Lakes with shore profiles obtained from offshore and onshore surveys.

4.4 Great Lakes Shore Management Study

Work continued on the Canada-Ontario Great Lakes Shore Management Study. The objective of the study is to develop methodologies for the preparation of shoreland management strategies by regional authorities located along the Great Lakes. An 18-mile reach of Lake Erie shoreland in Essex County was chosen for intensive study in order to develop alternatives and test evaluation procedures at a specific site. WP&M has been active in the development of methodologies for evaluating the cost and benefits of strategies for reducing flood and erosion damage. The development of methodologies for the evaluation of environmental impacts of shoreland developments has been another activity of the Branch. Draft reports on these methodologies have been prepared and the application of the methodologies to the study area is underway. The final reports on the study will be published in late 1979.

5.0 Flood Damage Reduction Program

The federal government is committed to alleviating human suffering and minimizing the costs of the damages caused by floods through strategies such as discouraging new investments in designated flood risk areas and participating in traditional flood control projects where these offer the best solution.

The Inland Waters Directorate, through its Water Planning & Management Branch, is involved in two projects with the Province of Ontario to reduce flood damage. One project provides flood protection to agricultural lands in southwestern Ontario, while the other is designed to reduce future flood damage across the province by identifying the hazardous areas and discouraging further development in these areas.

5.1 Southwestern Ontario Agricultural Land Dyking

Under the Southwestern Ontario Agricultural Land Dyking Agreement between Canada and Ontario, work continued on a dyking project designed to protect low-lying farmlands from floods caused by high runoff and storm conditions. The project was initiated in 1972-73 by the Department of Agriculture but, since 1974, the federal share of the project has been funded by the Inland Waters Directorate under the Canada Water Act. In the lower Thames area, dyking on the Thames River and its tributaries was completed during 1978. Dyking was underway along the east shore of Lake St. Clair, and this should be completed in March, 1979.

Work began on a frequency analysis of water levels in Chenal Ecarte, which empties into Lake St. Clair. A report on the results will be published by Water Planning and Management Branch in March, 1979. A review of the environmental impact of a dyke in the Dover Marsh area is being prepared by WP&M and will be published in February, 1979. The economic feasibility of several additional dyking proposals was evaluated by PR&SA. None of the proposals were found to be economically feasible.

5.2 Flood Damage Reduction

The mapping of flood risk areas is a prerequisite to the Flood Damage Reduction program. The information obtained from such an exercise will enable government departments and agencies, local authorities, and the public to discourage investment and development of flood-vulnerable structures in high risk areas. The Department, on behalf of the federal government, signed an Agreement with the Province of Ontario on March 31, 1978 calling for the mapping of flood risk areas and other flood damage reduction measures. The total cost of the agreement is $9.2M ($8.0M for flood risk mapping and $1.2M for other measures) to be shared equally. The term of the Agreement is 11 years (6 years for mapping), and it is retroactive to April 1, 1977.

In accordance with the Agreement, a Steering Committee was established and a Technical Subcommittee was formed to carry out the technical aspects of the program. A project review was prepared and will be utilized for all the work under this Agreement. A project priorization procedure was developed and is awaiting approval of the Steering Committee.

An intensive public awareness program was launched, utilizing the brochure "Cutting our Flood Losses" and an audio-visual slide presentation developed by IWD, Headquarters. In addition a one-minute animated film clip on the dangers of living on the flood plain was prepared by IWD, Headquarters and broadcast on many television stations in Ontario.

6.0 Water Management Program

One of the primary aims of the Water Management Program is to provide the basic water quantity and sediment data necessary for making valid assessments with respect to the influence of man's activities on the environment. Under the Federal-Provincial Cost Share Agreement on Water Quantity Surveys, IWD through its Water Resources Branch cooperates with the Ontario Ministry of the Environment, the Ministry of Natural Resources, and Ontario Hydro in collecting and publishing streamflow, water level, and sediment data. The purpose of the Agreement is to secure coordinated and standardized basic data to facilitate resource planning and management in general and the design and implementation of projects related to navigation, hydro-electric development, irrigation, drainage, flood control, recreation, as well as domestic and in-

dustrial water supply. As required by the Agreement, a Coordinating Committee, with the federal member as chairman, implements the terms of the Agreement which include maintaining national standards for field and office procedures, and for equipment and instrumentation. The Committee also designates the classification of all hydrometric stations based on nationally developed guidelines. The sharing of costs under the Agreement is based on this classification of stations.

Another important aim of the Water Management Program is to ensure that reliable and useful analytical data are produced by Water Quality Branch laboratories across Canada. Key activities in this regard are the development and standardization of analytical methods, the provision of suitable analytical reference standards, and the maintenance of a continuing quality control program.

The Great Lakes system is a vital part of the economy of Ontario, and variations in its levels affect many of its users. An important aspect of the Water Management Program is the preparation of a six-month forecast of Great Lakes water levels on a monthly basis for the Great Lakes Regulation Boards and users of the system. Forecasts of ice formation in the St. Lawrence River are also made during the early winter of each year.

6.1 Hydrometric and Sediment Surveys and Analysis

The Water Resources Branch operated a hydrometric network of 337 stations in Ontario as of April 1, 1978, and continued its processing and publishing responsibilities for an additional 64 stations which are operated by various other agencies. April 1, also marked the beginning of the fourth year of the Canada-Ontario Cost Share Agreement on Water Quantity Surveys. Of the 337 stations involved, 136 stations were designated as Federal, 30 stations as Federal-Provincial, 163 stations as Provincial, and 8 stations as Provincial-Provincial. Seven hydrometric stations were operated for the Toronto Area Airport Project involving the proposed Pickering Airport site.

The Water Resources Branch reached an agreement with Parks Canada effective October 1, 1978 for the recovery of costs from Parks Canada for the operation and maintenance of 16 hydrometric stations on the Rideau Canal and Severn Canal systems. The construction, operation and maintenance costs for new stations will also be recovered.

At the request of the Ontario Ministry of the Environment, the Branch continued operation of five hydrometric stations in the Elliot Lake area as part of an environmental assessment of the effect of expanding uranium mining operations in the area. Also, at the request of the Ontario Ministry of Natural Resources six stations were operated during 1978, in support of a multi-disciplinary water resource study involving land uses in the South Nation River system. Four of these stations were newly constructed and commenced operations during the year.

During 1978, the Branch took approximately 2,550 discharge measurements in Ontario. One hundred and twenty-eight (128) water quality samples were collected and sent to the Water Quality Branch analytical laboratory at Burlington. A network of 14 sediment stations was operated during the year and an additional 6 northern stations continued to be sampled at infrequent intervals. Metric conversion of water level recording gauges continued and approximately 260 stations (77% of the total network) have now been converted.

A Sediment Laboratory, transferred from WRB, Headquarters in Ottawa, became fully operational in Guelph in October, 1978. Approximately 1,430 sediment samples were collected and analyzed during 1978.

In February, 1978 a joint test program was commenced on an automated water level "Data Acquisition and Retrieval System" (DATS) by the Canadian Hydrographic Service, Burlington, Ontario, and the Water Resources Branch, Ontario Region. The gauge was developed by the Canadian Hydrographic Service for installation on the Great Lakes as well as in the Atlantic and Pacific tidal areas. A DATS gauge was installed on the North Thames River at St. Marys on a trial basis and after nearly a year of operation results have proven very satisfactory. As a result, WRB, has purchased one DATS gauge to be installed on the Missinaibi River at Mattice. The data from this site must be retrieved monthly for inclusion in the publication "Water Resources Review", and requires a monthly visit by a technician to read the present gauge. By installing a DATS gauge the monthly trip expense will be eliminated because the required data can be retrieved via data terminal and standard telephone line from the Guelph office. The DATS gauge is presently being marketed by Canadian Applied Technology (CAT) in Buttonville, Ontario. As a result of a demonstration meeting held at the Guelph office with a representative of CAT and a representative of the Conservation Authorities Branch (CAB), Toronto, the CAB agreed to test out the DATS gauge for possible flood warning applications.

6.2 Construction

The construction program for 1978-79 consisted of installation of two sheet steel pile weirs, eight hydrometric gauging stations, nine telemark water level transmitters, one cableway, two gauging station shelter replacements, one shelter enlargement and one sediment sampler shelter. In addition, twenty-four field investigations were made and eight discontinued hydrometric stations were dismantled. Major repairs and maintenance, were also carried out, such as updating and repairing electrical services, repairing cableways, repairing sheet steel pile weirs damaged during spring freshet, insulating gauge houses, installing thermostats to control heating units, installing lightning protectors and repairing gauge house doors and roofs damaged by vandals.

6.3 Training

The 1978 Water Survey of Canada, Ontario Region, Workshop was held in Guelph during November 28-30, 1978.

Mr. Ron Hore of the Ontario Ministry of Environment, Toronto, and Mr. Donald Knudson of the Canadian Hydrographic Service, Burlington, were guest speakers. Special training sessions and discussion periods were held regarding various activities and programs within the Branch. A tour of the Grand River Conservation Authority in Cambridge proved to be very informative regarding the activities of the Authority, especially with respect to flood control, flow forecasting and flood warning.

On several occasions during the year, staff of the Water Resources Branch demonstrated basic discharge measurement techniques to students from various technical training institutes and to employees of consulting firms. In November, the staff gave lectures on Hydrological Data Processing and Archival and Streamflow Measurement Procedures, respectively, at a Hydrometeorology course in Toronto.

A number of foreign officials visited the Guelph offices of the Water Resources Branch. Two Colombian hydrologists received training at the Guelph office during February. The training concentrated on hydrometric computational procedures and automated data processing. Mr. E. Olusola Adubifa of the Nigerian Meteorological Department, Lagos, Nigeria, visited the Guelph office in September as part of a refresher program given by his government in hydrometeorology. Also, in September Dr. Oye Ibidapo-Obe of the Nigerian Water Data Bank, University of Lagos, Nigeria, visited the Guelph office to consult on methods of data storage, computation and retrieval, appropriate for a comprehensive Hydrometric Data Management system that the University of Lagos is to implement for the Nigerian Government.

6.4 Data Control, Publication, and Distribution

The annual publication "Surface Water Data - Ontario to 1977" - was published in July, 1978, two months earlier than the issuing of the 1976 Report in 1977.

The "Historical Streamflow Summary - Ontario to 1976" was published and distributed to approximately 400 addresses on the mailing list. This triennial publication containing monthly mean as well as annual maximum and minimum discharge data is in its third edition.

The first edition of "Historical Water Level Summary - Ontario to 1976" was published during the year. The publication contains water level data from hydrometric stations where no streamflow measurement program is carried out and its format is similar to that of the "Historical Streamflow Summary".

Approximately 320 requests for technical data, advice and information were answered during the year. Some 2,150 station years of record were provided in meeting these requests. Several publications were supplied to individuals at their request.

The twelfth annual national Data Control Engineers' meeting was hosted by the Ontario Region at Niagara Falls, Ontario, in September. The meeting is attended by Data Control Engineers from all the Water Survey of Canada District Offices and by headquarters Data Control Section staff and is used as a forum to discuss the maintenance and creation of Canada-wide standards and procedures related to the computation, processing, publication and distribution of hydrometric survey data.

6.5 Network Planning and Evaluation

Systematic planning of hydrometric networks requires detailed data on hydrologically significant physiographic features of the region of interest. A physiographic data base for the entire Province of Ontario along with related index and drainage data had been compiled by the WRB and entered into a computerized data file by WRB, headquarters. The initial physiographic data file, completed in 1977, has been reviewed by the Network Planning and Flow Forecasting Section in Ottawa using a new computerized scanning routine. A number of erroneous records were detected and subsequently corrected by the Guelph office, WRB. The entire file containing some 12,113 records was resubmitted to Ottawa where complementary index and drainage files were created from the index and drainage data. The three files are presently catalogued on the University of Guelph computer and will be used in future investigations into network planning and flow forecast modelling.

6.6 Water Quality Methods Development and Quality Control

In response to requests from the Water Quality Branch regional laboratories several new analytical methods were developed: a method to optimize recoveries of mirex from waters ranging from lightly turbid to those containing larger amounts of suspended particulates; a procedure to separate mirex from interfering PCB's on a charcoal foam mini-column; a method for the analysis of arsenic and selenium; and a completely automated method for total mercury in saline waters and sediments.

In its role as national coordinator for both method development and quality control programs in all the IWD regional water quality laboratories, WQB, Ontario Region developed procedures for preparation of a homogeneous wet sediment in large quantities for future quality control studies; for long term preservation of arsenic and selenium in natural waters; and for long term storage of sediment samples for PCB's analysis.

Analytical reference standards, largely unavailable commercially, were synthesized, purified and provided on request to the regional laboratories. A notable example was the preparation of photomirex in a quantity sufficient for use as a primary analytical standard. Standard reference materials such as the bulk lake sediment and several bulk lake water samples were also prepared for analysis of trace metals and other inorganic parameters. The bulk sediment was split into three thousand sub-samples to be used for future interlaboratory quality control studies, and in-house method development and instrument calibration for regional laboratories.

A national quality control program which includes over ninety participating federal, provincial, commercial and other agency laboratories is operated by the WQB. Since many of these laboratories contribute analytical data to programs connected with water resource management and pollution control, an assessment of their reliability through the quality control program is essential.

Several national quality control studies, notably, trace metals in water, mercury in sediment, toxic metals in sediments, PCB's in wet sediments and phenoxyacid herbicides in lake water were conducted. An inter-regional quality control program provides samples to the six Water Quality Branch laboratories across Canada to ensure that data generated are compatible. In response to requests from IWD, Headquarters, the Branch has initiated some special quality assurance studies for the regional laboratories aimed at acquiring statements on accuracy, precision and detection limits for inclusion in the Water Quality Branch Methods Manual. These statements will aid data users in interpreting results produced by regional laboratories.

WQB also participated in a number of other national and international quality control studies. Examples include:

1) the coordination of the check sample program for water and sediment of the Federal Interdepartmental Committee on Pesticides. Under this check sample program the WQB initiated a study on herbicides in water involving more than twenty Canadian laboratories.
2) The design and execution of collaborative studies for standardization of analytical methodologies with international agencies and societies such as the International Joint Commission, the American Society for Testing and Materials and the Association of Official Analytical Chemists.
3) The distribution of samples for five quality control studies to some twenty U.S. and Canadian laboratories for the IJC Surveillance Subcommittee. These studies focussed on the analysis of total phosphorus, silica, minerals, nutrient, physical parameters and trace metals in water.

7.0 Baseline Studies Program - Hudson Bay Lowlands

The Hudson Bay Lowlands encompass over one-fourth of the land mass of Ontario and, for the most part, remain in a pristine state. In the past, water quality and quantity data have been collected on a very limited basis in this area. However, these data are essential to defining current baseline conditions in order to predict the environmental impacts of any proposed development and to provide a baseline against which future conditions can be compared.

Addressing this need for information, the Hudson Bay Lowlands project was initiated in 1975 to collect and interpret environmental baseline data. During 1978, a draft literature review and an annotated bibliography of available socio-economic and environmental impact information for the area was prepared by IWD. Also prepared was a revised draft literature review and annotated bibliography on available water resources information on the Lowlands. Gaps in the available information were identified in both reviews.

Water Resources Branch continued its regular program of streamflow data collection from existing gauging stations in the Hudson Bay Lowlands area and from stations located on rivers draining from the Precambrian Shield into the Lowlands. During the year, three hydrometric stations on the Precambrian Shield were discontinued.

The acquisition of water quality data was continued. Water samples for analysis were collected periodically by WRB staff from existing gauging stations in the Hudson Bay Lowlands and from stations located on rivers draining the Precambrian Shield into the Lowlands. These data, along with data collected from other streams throughout the province for the period 1967-1977 were incorporated into a report entitled, "Ontario Region Water Quality Data Interpretive Report" prepared by Water and Earth Science Associates, Ltd. for the Water Quality Branch. In addition, water quality surveys were carried out by the WQB on the Moose River to complete the pilot study in this area. The baseline program has been revised as a result of these two studies to more accurately assess seasonal variations and baseline conditions in the major northern rivers and elucidate the long term trends in water quality.

8.0 Environmental Assessment and Review Process (EARP)

Since 1973, development projects which have federal involvement such as airports, electric power plants, harbours, and sewage treatment plants have been required to pass through an Environmental Assessment and Review Process before federal funding or support is given. The primary objective of the process is to ensure that environmental effects are taken into account early in the planning of projects and that the results of the review are used to reduce the environmental impacts of the project.

During 1978 IWD, Ontario Region participated in a number of important EARP activities. Environmental evaluations were carried out on many projects, including proposals to channelize and dam a river, construct a power plant, build a causeway across the Welland Canal, extend the navigation season on the St. Lawrence Seaway into the winter and build a natural uranium fuel refinery.

A staff member of WP&M served on the Environmental Assessment Panel for the proposed expansion of Eldorado Nuclear Limited. Environmental Impact Statements were prepared by Eldorado Nuclear Ltd. for each of the three (3) prospective sites for its new natural uranium fuel refinery. The Impact Statements and site locations at Hope Township, Dill Township near Sudbury and Blind River respectively were reviewed by IWD personnel. Site inspections were arranged by Eldorado Nuclear Limited. From a socio-economic viewpoint the sites at Hope Township and Dill Township were found to be acceptable with the former

site more cost effective. The Blind River site was considered unacceptable owing to potential problems with housing and retention of construction and operating staff at such a remote and under-developed townsite. Reviews and comments on surface drainage, water quality and other environmental impacts of the proposed development at these sites were prepared by staff of WRB and WP&M.

9.0 Information Transfer and Interpretation

It is important to communicate with the public on the various water management programs being carried out by the Directorate in Ontario Region. Public concerns should be identified and public interest and involvement in the water programs promoted by providing information in readily understandable form through pamphlets, seminars and workshops, correspondence and the news media, and in displays at appropriate special public events.

9.1 Toronto International Boat Show

In the past several years, IWD, Ontario Region has through its Water Planning and Management Branch participated in displays at the Toronto International Boat Show held in January of each year. This year the IWD display was expanded to show some of the work being done by the Water Resources and Water Quality Branches in addition to material presented by the Water Planning and Management Branch on the effects of water level fluctuations on docks and shore properties. The Water Resources display consisted of a typical hydrometric station installation complete with an operational water level gauge, telemark and varying water levels. The Water Quality Branch set up three Autoanalyser automatic water quality analysers for their Boat Show display. Their exhibit included panels depicting aspects of the Branch's laboratory and field activities.

9.2 Summer Job Corps

Sixty-nine students were employed during the summer with $97,000 of Employment and Immigration funding. They were divided into two project groups as follows:

a) *Great Lakes Water Use Map*
This group researched current data on Great Lakes water use and produced an updated Great Lakes Water Use Map which is currently being published. An accompanying brochure to provide resource material for public and high school teachers to interpret the Map was initiated by this group and will be completed by a follow-up group in the summer of 1979.

b) *Von Neumann Morgenstern Public Values Technique*
This group surveyed the public in Windsor, Toronto, Kingston, Peterborough and Sudbury. The survey was to establish a new technique (Von Neumann Morgenstern) for valuing societies' utility for water quality and beach use density. The technique appears to be valid and the results of the survey will be published in 1979.

10.0 Management and Administration

In 1978, the Directorate administered and managed resources amounting to 5.75 million dollars and 117.5 man-years. The resources included operational funding under international and federal-provincial agreements as well as grants and contributions under similar agreements. Significant federal-provincial cost-shared funding administered in 1978 included the Canada-Ontario Great Lakes Water Quality Agreement funding ($1,200,000) and the Southwestern Ontario Agricultural Land Dyking Agreement funding ($400,000).

11.0 Publications and Presentations:

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DEPARTMENT OF THE ENVIRONMENT

INLAND WATERS DIRECTORATE - ONTARIO REGION

ORGANIZATION CHART

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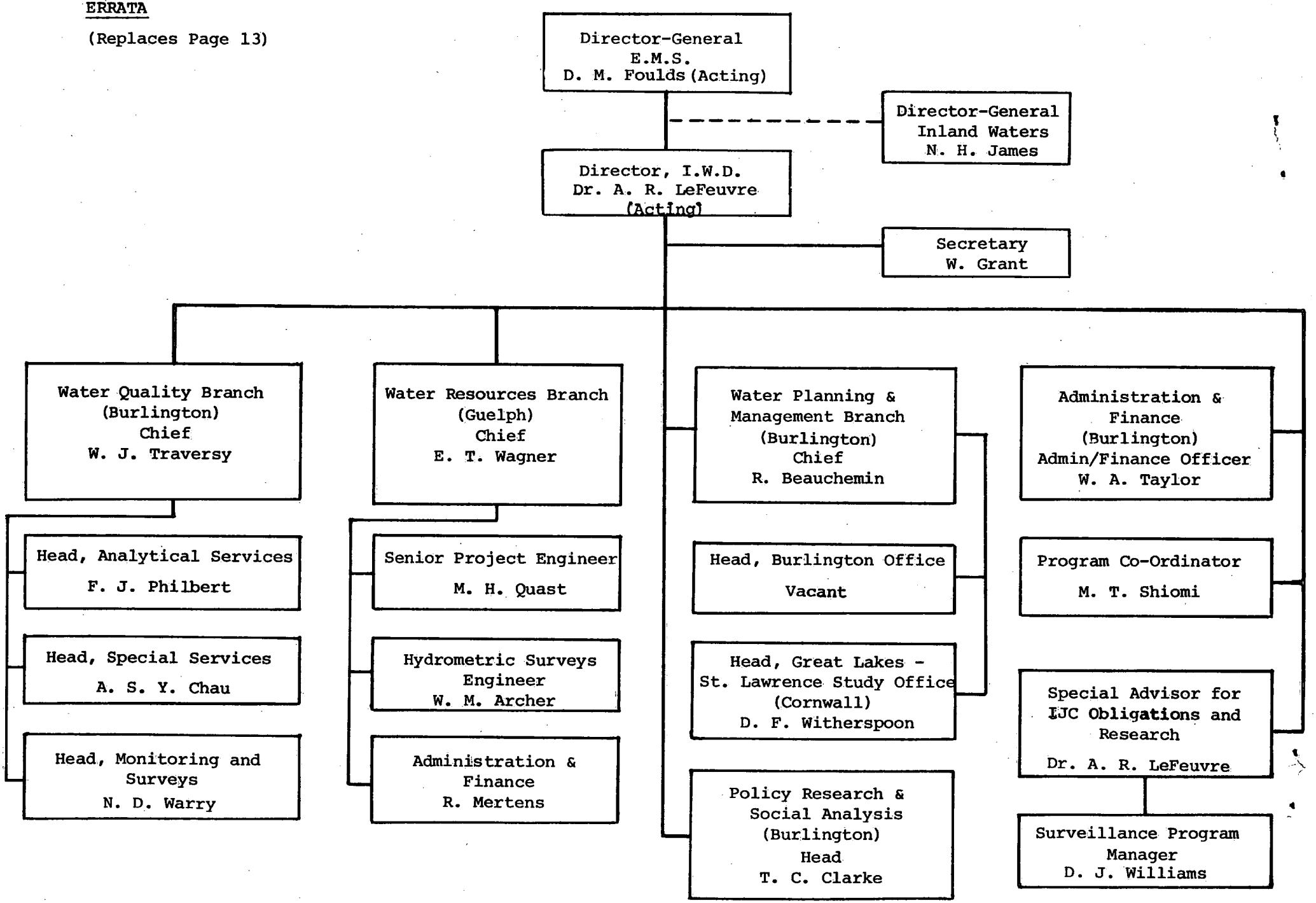
(Replaces Page 13)



December 31, 1978

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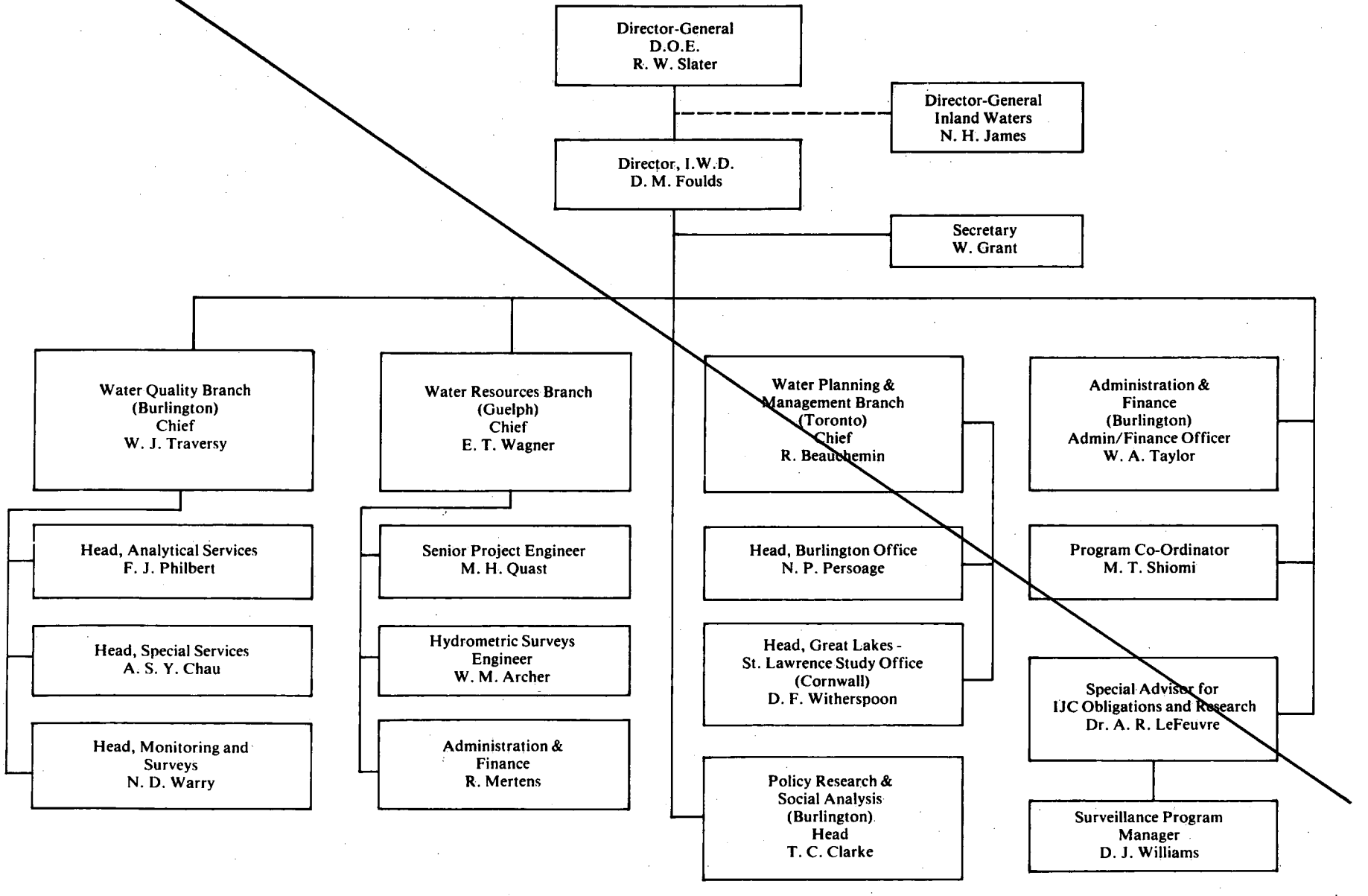
INLAND WATERS DIRECTORATE - ONTARIO REGION
ORGANIZATION CHART



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