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ENVIRONMENTAL MANAGEMENT SERVICE
DEPARTMENT OF FISHERIES AND THE ENVIRONMENT

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TABLE OF CONTENTS

| | PAGE |
|---|------|
| 1.0 Introduction | 1 |
| 2.0 Great Lakes and St. Lawrence River Basin Water Level Control Program | 3 |
| 2.1 Boards of Control | 3 |
| 2.2 Study Boards | 3 |
| 2.3 Great Lakes and Interconnecting Channel and Water Levels Monitoring | 4 |
| 3.0 Great Lakes Basin Water Pollution Program | 4 |
| 3.1 Canada/U.S. Open Lake Surveillance and Analysis | 5 |
| 3.2 Connecting Channels Water Quality | 5 |
| 3.3 Socio-Economic Studies and Modelling | 5 |
| 3.4 International Reference Group on Great Lakes Pollution from Land Use Activities (PLUARG) | 6 |
| 4.0 Great Lakes Shoreline Management and Damage Reduction Program | 6 |
| 4.1 Great Lakes Shoreline Hazard Mapping | 6 |
| 4.2 Public Awareness of Great Lakes Shoreline Damage | 6 |
| 4.3 Great Lakes Shoreline Monitoring | 6 |
| 4.4 Great Lakes Shoreline Management Study | 7 |
| 5.0 Flood and Erosion Damage Control Program | 7 |
| 5.1 Southwestern Ontario Dyking | 7 |
| 5.2 Flood Damage Reduction | 7 |
| 6.0 Water Management Program | 7 |
| 6.1 Hydrometric and Sediment Surveys and Analysis | 8 |
| 6.2 Data Control, Publication, and Distribution | 9 |
| 6.3 Network Planning and Evaluation | 9 |
| 6.4 Water Quality Methods Development and Quality Control | 9 |
| 7.0 Environmental Assessment and Review Process (EARP) | 10 |
| 7.1 Ontario Royal Commission on Electric Power Planning (Porter Commission) | 10 |
| 8.0 Baseline Studies Program — Hudson Bay Lowlands | 11 |
| 9.0 Information Transfer and Interpretation | 11 |
| 10.0 Management and Administrations | 11 |
| 11.0 Publications and Presentations | 13 |
| 12.0 Organization Chart | 15 |

1.0 Introduction

Inland Waters Directorate (IWD), Ontario Region is a component of the federal Department of Fisheries and 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.

Organizationally, this Directorate is grouped together in the region with the Lands, Forests, and Wildlife Directorates forming the Environmental Management Service, Ontario Region. The Environmental Management Service has the following objectives:

- a) to help ensure the long-run availability and diversity of renewable resources for Canadians, including the perpetuation of Canada's wild flora and fauna;
- b) to assist in the effective and efficient use of renewable resources and their transformation into goods and services;
- c) to assist in the resolution of conflicts among competing resource uses, and between resource uses and their environmental setting; and
- d) to minimize the adverse effects of human activities on the environmental setting and on the supply of renewable resources.

The Inland Waters Directorate, Ontario Region is responsible for carrying out water resource programs, policies, and operations in the Ontario Region aimed at achieving these objectives.

The primary role of the Directorate is related to the gathering and dissemination of information and to explaining and predicting the behaviour of the quantity and quality of the waters in the Ontario Region with particular emphasis on the Great Lakes and their connecting channels. It plays a major role in carrying out water use planning and management investigations including Great Lakes shoreline 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 membership and participation on 21 Boards, Working Groups, and Committees. The IJC was established by the Boundary Waters

Treaty of 1909 and was given further responsibilities under the Canada-U.S. Great Lakes Water Quality Agreement signed in 1972. The Canada-Ontario Great Lakes Water Quality Agreement signed in 1971 provided the instrument for the cooperation of the two jurisdictions 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 dyking, planning studies such as the Canada-Ontario Great Lakes Shore Damage Survey and other cooperative arrangements such as the Federal-Provincial Cost Share Agreement on Water Quantity Surveys.

Operationally, the Directorate is organized into three Branches and one Division: the Water Planning and Management Branch; the Water Resources Branch; the Water Quality Branch; and the Policy Research and Social Analysis Division.

The Water Planning and Management Branch provides support for all the International Joint Commission's Great Lakes Boards of Control; monitors the activities of other water operating agencies such as the St. Lawrence Seaway Authority and power entities; carries out water level and flow regulation studies; and participates in socio-economic, shore damage, and environmental review activities.

The Water Resources Branch operates and maintains a network of streamflow, water level, and sediment stations throughout Ontario and the Great Lakes system; 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 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 provides advice to the Director and the 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.

Under the Environmental Management Service Program Activity Structure initiated in 1976, the activities of the Directorate are divided amongst comprehensive regional programs each of which is directed by a lead

agency and utilizes resources and expertise from the respective Branches of Inland Waters Directorate and indeed from the different Directorates of the Environmental Management Service in the Ontario Region. The following is a description of the activities carried out within this program structure during 1977.

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

The Great Lakes and their connecting channels have been the key to the development of the heartland of North America. The Great Lakes are used for recreation, navigation, power generation, and potable water supply, as well as for assimilating waste from man's activities in the basin. About one Canadian in three lives adjacent to and depends upon the Great Lakes-St. Lawrence system for their livelihood.

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 International Joint Commission 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 the two countries regarding activities that affect the levels and flows in the Great Lakes-St. Lawrence River system.

The Inland Waters Directorate, Ontario Region, through its Branches and Division, provides advice and assistance to the International Joint Commission and other bilateral entities in carrying out the terms of the various agreements between the two countries.

2.1 Boards of Control

The Water Planning and Management Branch continued to support the International Joint Commission's International Lake Superior and St. Lawrence River Boards of Control in regulating the outflows of Lakes Superior and Ontario. The levels of Lake Superior and Lake Ontario were slightly below normal during early and mid-1977. However, high water supplies to these lakes during the latter part of the year caused their levels to rise above their long-term averages for the remainder of the year. On the unregulated lakes — Lakes Michigan, Huron, St. Clair, and Erie — the water levels remained generally above their long-term means throughout the year.

On the Niagara River, technical support was provided to the Commission's International Board of Control regarding the water control activities in the Lake Erie-Niagara River area. The Niagara Board also monitored, on behalf of the Commission, the operation of the Lake Erie-Niagara River Ice Boom and carried out related studies. Branch staff 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 under the Treaty. Following the relocation of the American Falls Channel Gauge in 1976, the Branch, with support from the Water Resources Branch, undertook a field and office study to evaluate the proportion of total Niagara Falls flow which passes over the American Falls.

Other water management activities carried out by the Branch included monitoring the operation of the ice booms in the St. Marys and St. Lawrence Rivers, a study of the feasibility of protective measures for the Lake Superior Compensative Works, a study of the Great Lakes Power Company's proposed power redevelopment at Sault Ste. Marie, and the development of a new regulation plan for Lake Superior. Branch personnel also initiated a research project with the Hydraulics Division of the Canada Centre for Inland Waters (CCIW) to study the effect of ice cover on flow in the Beauharnois Canal near Montreal. International efforts to extend the navigation season in the Great Lakes-St. Lawrence River system continued to require the Branch's attention.

2.2 Study Boards

In May 1977, the International Joint Commission, 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 for limited Lake Erie regulation; and (b) the International Great Lakes Diversions and Consumptive Uses Study Board to examine the effects, on the Great Lakes water levels and flows, of existing and proposed diversions and consumptive uses. The Water Planning and Management Branch, Ontario Region and its Headquarters in Ottawa provide extensive membership on these two Boards, their Working Committees and Subcommittees, and have undertaken the necessary studies and investigations. A Plan of Study, developed for each Board, was approved by the Commission.

A staff member of the Policy Research and Social Analysis Division was named a member of the Lake Erie Regulation Study Ad-Hoc Economics Subcommittee. This group will be concerned with the compatibility and consistency of the methodologies and analytical study results of the various working subcommittees charged with evaluating regulation effects on power, navigation, coastal zone, and environmental interests.

The Special Advisor for IJC Obligations and Research, IWD, Ontario Region was appointed 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 Chairman of the Working Committee in coordinating the study efforts.

2.3 Great Lakes and Interconnecting Channel and Water Levels Monitoring

The Water Resources Branch operated and maintained forty-two water level recorders for the Canadian Hydrographic Service on the Great Lakes and downstream as far as Summerstown on the St. Lawrence River. As a result of a review of the need for the various water level gauges along the St. Lawrence River, the stations at Prescott and Long Sault were discontinued and a new station proposed for construction in the Brockville area in 1978. The Point Pelee East station was taken out of service as a result of intake damage. Conversion of all primary gauges to the metric system was completed and conversion of the back-up strip chart gauges was started, with eight having been converted by the end of the year.

Personnel from the Detroit District, U.S. Army Corps of Engineers, and the Water Resources Branch undertook three joint measurement programs:

- a) In August, discharge measurements were taken for flow distribution in the St. Lawrence River in the proximity of Grindstone and Wellesley Islands near Rockport, Ontario.
- b) In the last week of November, 22 measurements in the flow range 5,700 to 1,900 cfs were taken on the American Falls Channel of the Niagara River. These measurements were required to verify and extend the existing stage discharge relationship of the relocated American Falls Channel gauge.
- c) In the first week of December, 9 measurements in the range of 52,300 to 85,300 cfs were taken from the Robert Moses metering cableway located in the lower Niagara River. These data were required to verify the stage-discharge relationship of the Ashland Avenue gauge which indicates the flows over the Niagara Falls and the outflow from 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 in the coastal zone of the Great Lakes and rely on them for a ready source of water for domestic and industrial use and as assimilators of their wastes. Truly, the Great Lakes are 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 prevent further deterioration of the Great Lakes and provided the basis for the continued improvement of existing degraded conditions. The IJC has been given the responsibility to assist the two governments in the implementation of the Canada-U.S. Great Lakes Water Quality Agreement. IWD provides extensive membership and scientific support to the IJC's Boards and Committees in carrying out activities relating to the implementation of this 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 five years. This Agreement provides the instrument for the cooperation of the two jurisdictions in Canadian clean-up efforts in the Great Lakes and for Ontario to cooperate with governments in the United States in implementing the Canada-U.S. Agreement on Great Lakes Water Quality. The Agreement also provides for the cost-sharing of provincial surveillance activities on a 50-50 basis.

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

In 1977, 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.

The Branch staff participated in the seventeen water quality survey cruises carried out on the international Great Lakes during the year. Nine of these cruises, each of which involved the sampling of 94 stations in Lake Ontario, took place in the period between March 14 and November 21. A total of 1,437 samples were analyzed on board ship for over 4,310 tests, and over 2,860 samples were analyzed in the main laboratory at CCIW for some 21,520 tests. One hundred and seven stations were sampled on each of the eight cruises conducted on Lake Erie between May 24 and October 17 in support of special studies by CCIW Branch. A total of 2,727 samples were analyzed on board ship for 5,454 tests, and 3,849 samples were analyzed in the main laboratory for 7,874 tests.

Water Quality Branch staff, using data from the surveillance program, completed data analysis and interpretation for the IJC Surveillance Subcommittee Annual Report. The Branch staff also had extensive input to the Lake Ontario Surveillance Working Group. Also, data collected from previous cruises on Lake Huron and the North Channel were tabulated.

An assessment was made of available water quality data for the Sarnia and Brockville water intakes on the Great Lakes. Data from the Brockville station were evaluated for long-term trend assessment and an internal report was prepared. The data for this study was provided by the Ontario Ministry of the Environment.

A fourteen-station network for the sampling of precipitation was maintained on the Canadian side as part of the Water Quality Branch's commitment to the IJC Great Lakes Surveillance. Seven Sangamo automatic samplers were added to the network to make a total of nine. The Branch continued to operate eight bulk samplers in the network with three stations having both automatic and bulk samplers for comparison purposes. Major ions, trace metals, nutrients, conductivity, and pH were measured on all samples collected. A report entitled "Atmospheric Bulk Precipitation in the Lake Erie Basin" was prepared. Atmospheric loading estimates to the Great Lakes were calculated and reported to the IJC Surveillance Subcommittee.

Analytical support services were provided to over 53

studies and projects related to programs of the federal government, the IJC, and other agencies. Over 23,500 samples comprising of water, waste water, sediments, fish, and other biota were analyzed. The total number of tests performed was in excess of 150,000.

A Finnigan gas chromatograph/Mass spectrometer which is used for the identification of trace organic contaminants was received and set up in the analytical laboratory. The system was put into regular use towards the end of the year and has been performing satisfactorily.

Plans to computerize laboratory operations were implemented during the year. System developments progressed steadily throughout, and it is hoped to have a working system by about mid-1978.

3.2 Connecting Channels Water Quality

Water quality monitoring and surveillance activities on the connecting channels were continued during the year. The Water Quality Branch continued its daily sampling studies by operating automatic samplers in the Niagara River at Niagara-on-the-Lake and at Wolfe Island on the St. Lawrence River to determine phosphorus and chemical loadings in and out of Lake Ontario. In addition, suspended sediment samples were collected from the Niagara River at bi-weekly intervals to quantitatively identify persistent contaminants in the aquatic environment. Six water quality surveys were carried out in the international section of the St. Lawrence River from Kingston to Cornwall. Seventy-nine stations were sampled on each survey and over 5,100 tests were done on some 638 samples in the field while an additional 17,230 tests were done in the main laboratory.

3.3 Socio-Economic Studies and Modelling

Final revisions to the Upper Lakes Waste Loadings Model were completed and the resultant waste loading projections forwarded to the International Joint Commission by staff of the Policy Research and Social Analysis Division for inclusion in the final report of the IJC's Upper Lakes Reference Group. The Upper Lakes Waste Loadings Model is designed to predict future industrial and municipal point source waste loadings to the Upper Great Lakes.

Three reports, prepared by the Division, were published and released by the IWD Publications Branch in Ottawa: "The Production, Use, and Distribution of Lead in Canada", "Livestock and Poultry Wastes in the Great Lakes Basin - Environmental Concerns and Management Issues", and "The Production, Use, and Distribution of

Phthalic Acid Esters in Canada". To date, approximately 700, 915, and 500 copies respectively have been distributed on request from individuals.

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

The International Reference on Great Lakes Pollution from Land Use Activities (PLUARG) was established by the IJC in 1973 to study pollution in the Great Lakes from agricultural, forestry, and other land use activities. The basic question being addressed by the study is whether the boundary waters of the Great Lakes system are being polluted by land drainage and, if so, what remedial measures will provide improvements in controlling pollutants from land usage. IWD, Ontario Region input to this study is primarily related to inventory, trend assessment, and projections of land use practices.

The Policy Research and Social Analysis Division completed an inventory of all industrial and municipal point source discharges in the Great Lakes Basin. The data was organized by watershed and is summarized in the report "Point Source Waste Loadings in the Canadian Great Lakes Basin". Also, a preliminary investigation of the social and economic effects of the eutrophication of the Great Lakes was carried out and a paper written, entitled "Social and Economic Implications of Eutrophication in the Canadian Great Lakes Basin".

Additionally, as a part of the activities of the Overview Modelling team, the statistical properties of the land use, land form, and tributary loadings relationships were examined. Outputs from this exercise will aid in the final PLUARG modelling exercise. To provide further aid in the PLUARG forecasting exercise, a draft paper, entitled "Scenarios on Social, Institutional, Technological and other External Factors, and Their Impact on Land Use Forecasts for the Canadian Great Lakes Basin to the Year 2020", was completed.

4.0 Great Lakes Shoreline 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 shoreline. 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 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 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 Shoreline Hazard Mapping

During 1977, work continued on the mapping of flood and erosion prone areas on the Great Lakes. Maps are being prepared for most of the Great Lakes erodible shoreline on a 1:10,000 and 1:20,000 scale. The project will be completed in early 1978 and the maps will be distributed to local municipalities and Conservation Authorities for planning purposes. Copies will also be available to the general public.

4.2 Public Awareness of Great Lakes Shoreline Damage

The Water Planning and Management Branch continued to support a joint federal-provincial information program to make the public more aware of the problems of locating in the shore zone. Branch representatives participated in the conduct of several workshops in 1976 and 1977 with representatives from local municipalities and professional associations concerned with shoreline management.

4.3 Great Lakes Shoreline Monitoring

Another outcome of the Canada-Ontario Great Lakes Shore Damage Survey is the federal-provincial joint funding of a five-year shoreline erosion monitoring program on the lower Great Lakes commencing in 1976. IWD provides the federal funding for this program.

4.4 Great Lakes Shoreline Management Study

In 1977, a major federal-provincial shoreline management study was also initiated. The objective of the study is to develop methodologies for evaluating the feasibility,

costs, and benefits of various shoreline management strategies for reducing flood and erosion damage on the Great Lakes. An 18-mile reach of Lake Erie shoreline in Essex County was chosen for intensive study in order to develop alternatives and test evaluation procedures at a specific site. The Water Planning and Management Branch has been very active in project planning and organization and in the development of methodologies for evaluating environmental effects and future damage from erosion and flooding. Policy Research and Social Analysis Division provided assistance in the form of forecasting methodology and basic data collection. The study will be completed in the Fall of 1978.

5.0 Flood and Erosion Damage Control Program

The federal government is committed to alleviating human suffering and minimizing the costs of the damages caused by floods through strategies such as the discouragement of 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 and Management Branch and Policy Research and Social Analysis Division, 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 Dyking

Under the Southwestern Ontario 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 is nearing completion. Dyking was also underway along the east shore of Lake St. Clair, and this should be tied into the Thames River dyke in 1978.

Policy Research and Social Analysis Division staff

provided coordination and principal authorship to a cost-benefit study of further dyking works under the Southwestern Ontario Dyking Agreement. This report was completed and forwarded to the Joint Committee responsible for the projects.

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 initiated negotiation in 1975 with the Ontario Ministry of Natural Resources to enter into a joint federal-provincial program.

During 1977, negotiations continued with the province in the preparation of an agreement respecting flood risk mapping and other flood damage reduction measures for Ontario. The text of the draft agreement was largely completed by early 1978.

6.0 Water Management Program

One of the primary aims of the Water Management Program is to provide 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 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 industrial 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.

Another important aim of the program is to ensure that reliable and useful analytical data are produced by Water Quality 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 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 users of the system as well as the various Great Lakes Regulation Boards.

6.1 Hydrometric and Sediment Surveys and Analysis

The Water Resources Branch operated a hydrometric network of 345 stations in Ontario as of April 1, 1977, and continued its processing and publishing responsibilities for an additional 60 stations which are operated by various other agencies. April 1 also marked the beginning of the third year of the Canada-Ontario Cost Share Agreement on Water Quantity Surveys. Of the 345 stations involved, 144 stations were designated as Federal, 41 stations as Federal-Provincial, and 160 stations as Provincial. Seven hydrometric stations were operated for the Toronto Area Airport Project involving the proposed Pickering Airport site.

At the request of the Ontario Ministry of the Environment, the Branch commenced 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 in support of a multidisciplinary water resource study involving land uses in the South Nation River system, two stations were constructed and operated during 1977 with an additional four stations proposed for 1978.

During 1977, the Branch took approximately 2,300 discharge measurements in Ontario. One hundred and forty-four (144) water quality samples were collected and sent to the analytical laboratory at Burlington. A network of 12 sediment stations was operated during the year and an additional five northern stations continued to be sampled at infrequent intervals. Approximately 1,400 sediment samples were collected and sent to the laboratory in Ottawa for analysis.

Metric conversion of water level recording gauges continued and approximately 60 stations have now been converted. As a result of the low flow conditions and lack of precipitation during mid-1977, two reports were prepared on the drought conditions in Northwestern Ontario. Streamflow conditions, however, had returned to

near normal at most stations by late September. Snow cover and soil moisture data were collected in support of the Lake Superior Basin Airborne Gamma Ray Snow Survey beginning in late 1977. The survey data will be utilized in a hydrometric model to predict outflows from, and water levels of, Lake Superior.

The construction program for 1977-78 consisted of the installation of four sheet steel pile weirs, ten hydrometric gauging stations, eight telemark water level transmitters, two large field storage shelters, and one sediment sampler shelter. In addition, seventeen field investigations were made and five discontinued hydrometric stations were dismantled. Major repairs and maintenance, such as updating and repairing electrical services, rebuilding of instrument shelters, installing auxiliary water intake pipes, repairing brick work damaged by ships, and repairing sheet steel pile weirs damaged during spring freshet, were also carried out. During July, the North Bay sub-office was relocated from their offices in the old Post Office building. The new facilities on the outskirts of North Bay are much more suitable for the type of operations conducted and consist of office, storage, and garage facilities side by side on the ground floor.

The Water Resources Branch hosted a one-week pilot course in hydrology for technical staff of the Branch. The course, held in February in Belleville at Loyalist College, was organized by Headquarters with input support from the Regions. Of the twenty participants, seventeen were from Ontario Region, two from the Western and Northern Region, and one from the Atlantic Region. Several of the Water Resources Branch engineering staff attended a two-week Professional Development Course on Hydrology at the University of Guelph during August. The course involved lectures from the Civil Engineering Department, University of Guelph; Atmospheric Environment Service, Toronto; and Canada Centre for Inland Waters in Burlington. Participants were from Water Resources Branch regional offices and various provincial agencies across Canada. The course was developed specifically for those participating and involved close consultation with Headquarters, University of Guelph extension personnel, and regional Water Resources Branch personnel. The Branch also hosted a Supervisors Training Course in Guelph during November. In addition to those from Guelph, there were participants from each Region in Canada, as well as two observers from Canada Centre for Inland Waters. This marks the return of this course to Guelph as the pilot course was held here in 1975.

On a number of 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 engineering firms. In November, two members of the Branch participated in the Georgian College Career Day Program. The purpose of the Day, in addition to exposing elementary and secondary students to post-secondary education, was to bridge the gap between post-secondary training and the real world of work, jobs, and careers. In line with this, the Branch provided instrumentation, displays, handouts, and answered questions as some 3,000 students and adults toured the facilities.

A number of foreign officials visited the Guelph offices of the Water Resources Branch. In March, Dr. Damrong of the Royal Irrigation Department, Thailand was briefed on the hydrometric data gathering organization across Canada and received a detailed briefing on the Ontario Region's Data Control operations. In June, three more nationals from Thailand visited Guelph and spent several days gaining insight into data collection and processing procedures and standards. Their visit included a trip to the field to carry out discharge measurements. Preliminary discussions were held with an Ontario based consulting firm involved with a World Bank funded hydrology study of the Upper Amazon River in Peru. Initial plans were drawn up for a three-month familiarization training program for two Peruvian nationals to be carried out in 1978. The Pacific and Yukon Region Water Resources Branch will provide training in sediment and the Special Services Section, Water Resources Branch, Ottawa will provide training in special techniques such as the moving boat method of measuring discharges on wide streams.

6.2 Data Control, Publication, and Distribution

The annual publication *Surface Water Data - Ontario - 1976* was published in September, 1977, one month earlier than the issuing of the 1975 Report in 1976. A computer program based on a two gauge slope relationship was written for the automatic determination of discharges for the Otonabee River at Lakefield hydrometric station on the Severn-Trent Canal and River System. Several computer programs were written to automate the listing of gauging station information such as gauge readers, telemarks, and type of station data. Approximately 400 requests for data, over 300 of them by agencies outside of EMS, were answered by the Water Resources Branch at Guelph. In addition, more than 200 requests were answered by its Sub-offices at Ottawa, North Bay, and Thunder Bay. These requests resulted in the provision of

approximately 2,000 station years of discharge, water level, water temperature, and sediment records to universities, industries, federal and provincial agencies, and private sector (consultants) data users.

6.3 Network Planning and Evaluation

In the area of hydrometric network planning, a Type 1 physiographic data file containing 12,100 records covering the entire province of Ontario was assembled, indexed, and edited. The file currently resides on punch cards and magnetic tape. Each record represents a 10 km square on the UTM grid system and contains up to 12 parameters defining its topography, physiography, land use, and drainage patterns. A catalogue of streamflow records for former IHD and surrounding stations in Ontario was prepared for the Associate Committee on Hydrology in support of the National Basin Program.

6.4 Water Quality Methods Development and Quality Control

Several new analytical methods were developed and implemented in the Water Quality Branch laboratories: a sensitive method for MCPA and MCPB herbicidal acids in waters; a multi-residue method for eight phenoxyalkanoic acid herbicides in waters; and a procedure for longer-term preservation of low level of mercury in natural waters.

As a national coordinator of method development of all regional IWD water quality laboratories, the Branch undertook work on preservation studies, particularly on herbicides in water; analysis of mirex and photomirex in sediments; development of a confirmation procedure for positive identification of mirex residue in environmental samples; a procedure to eliminate the interferences of PCB's in the analysis of mirex and photomirex in water and in sediment; an automated method for the determination of total dissolved mercury in fresh as well as saline waters; simultaneous extraction and analysis of mercury and arsenic in fish tissue; and an open digestion method for the analysis of metals in sediments. Analytical reference standards, most of which were commercially unavailable, were also prepared and purified and provided on request to the regional laboratories. Also, the Branch coordinated information from various agencies within the Department in the preparation of an inter-agency report by a special committee reviewing mercury sampling and analysis.

A national quality control program which includes participation by federal, provincial, commercial, and

other agency laboratories is operated by the Branch. Since many of these laboratories contribute analytical data to programs connected with water resources management and pollution control, an assessment of their reliability through the quality control program is essential.

Several national quality control studies, notably herbicides in water, mercury in precipitation, low level of mercury in natural waters, and metals in lake sediments, were conducted. With the increasing emphasis on sampling of particulates and bottom sediments, sediment reference material was prepared for intra- and interlaboratory quality control studies and for in-house method and instrumental calibration among regional laboratories. Water Quality Branch also coordinated the check sample program of the Federal Interdepartmental Committee on Pesticides in water and in sediment. The Branch staff designed and executed collaborative studies for standardization of analytical methodologies with international agencies such as the International Joint Commission, the American Society for Testing and Materials, and the Association of Official Analytical Chemists.

7.0 Environmental Assessment And Review Process (EARP)

Since 1973, development projects such as airports, electric power plants, harbours, and sewage treatment plants must 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 1977, Water Planning and Management Branch staff participated in a number of important EARP activities. Environmental evaluations were carried out on some fifteen projects including proposals to construct large dams, headlands, large docks, marinas, and commercial developments in the Great Lakes shore zone. The Branch served as lead agency for the Coastal Processes Working Group and played a leading role in a number of activities in the areas of coastal zone management and power generation. Policy Research and Social Analysis Division staff also participated in the Coastal Processes Working Group. Highlighting these activities was the preparation of the Lake Ontario Problem Analysis Report in the summer of 1977 by the Coastal Processes Working Group.

The Branch provided substantial support in the

environmental evaluation of the Canada-Ontario Shoreline Damage Survey Follow-up Program. It is also embarking upon a lead role for evaluating the environmental effects of Lake Erie outflow regulation, the feasibility of which is being investigated by the International Joint Commission.

A staff member of the Branch served on the Environmental Assessment Panel for the proposed plant expansion of Eldorado Nuclear Limited. The Branch also provided technical support in the Department's review of the proposed project along with the Policy Research and Social Analysis Division which provided an analysis of the social impact aspects and the Water Resources Branch which addressed surface water concerns. IWD staff participated in public hearings related to the project.

7.1 Ontario Royal Commission on Electric Power Planning (Porter Commission)

Policy Research and Social Analysis Division provided project leadership in the planning, development, and presentation of a second Departmental submission to the Porter Commission in May 1977, entitled: "Electric Power Production and Transmission in Ontario from an Environmental Perspective". The submission dealt with renewable energy sources such as solar, wind, and biomass and set out Departmental positions and recommendations relating to nuclear, conventional, and renewable energy sources.

As a follow-up to the Porter Commission Hearings, the submission project leader authored the following papers:

"Project Management and Organization for Preventive (Anticipatory) Environmental Management [A Case Study of the Participation by DFE in the Public Inquiry by the Ontario Royal Commission on Electric Power Planning]"

"Comparing and Assessing the Environmental Implications of Conventional, Nuclear, and Renewable Energy Options for Electric Power Production in Ontario" (Based on Sections 9-11 of final draft version of Technical Paper of April 19, 1977.)

"Energy Conservation and Environmental Management: A Synergistic Partnership Toward a Sustainable Society" (Paper based on first draft of Energy Conservation Paper of March 10, 1977.)

"An Environmentally Sustainable Society for Ontario: Solution to the Energy Problem?"

"Ontario 2000+: A Proposal for a Participatory Goals Process Leading to a Consciously Determined Future

Society for Ontario" (Companion paper to environmentally sustainable society paper above.)

8.0 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 present conditions in order to predict the environmental impacts of any proposed development and to provide a baseline to 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 1977, a draft literature review and an annotated bibliography of available water resources information for the area were prepared for final review and publication. Gaps in the available information were also identified in the review.

Data collection continues to be an important aspect of the project. Stream flow data were collected regularly by the Water Resources Branch from existing gauging stations in the Hudson Bay Lowlands area and from stations located on rivers draining from the Precambrian Shield into the Lowlands. Water quality data were collected on a periodic basis at many of these stations. In addition, six water quality surveys were carried out on the Moose River by the Water Quality Branch as part of a pilot study to determine trends in the water chemistry and to calculate chemical loadings flowing into James Bay. The Water Quality Branch assisted other Directorates involved in the Hudson Bay Lowlands project by analyzing water samples collected.

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.

In the past several years, the Water Planning and Management Branch participated in displays at the annual Toronto International Boat Show. During the

1977 show, the main theme of the display was fluctuating water levels and the flood and erosion problems on the Great Lakes. A report on Coordinated Great Lakes Basic Data, dated May 1977, was distributed to about 300 public libraries, colleges, and universities in Ontario. It contains information on the Great Lakes such as drainage and water surface areas, water volumes, shoreline length, etc.

10.0 Management and Administration

In 1977, the Directorate administered \$6.37 million or 33% of the Environmental Management Service, Ontario Region financial resources and 119.5 man years or 19% of the man-year resources. The resources administered and managed included operational fundings under international and federal-provincial agreements as well as grants and contributions under similar agreements. Significant federal-provincial cost-shared funding administered in 1977 included the Canada-Ontario Great Lakes Water Quality Agreement funding (\$1,200,000) and the Southwestern Ontario Diking Agreement funding (\$2,000,000).

In September 1977, Dr. A. R. LeFeuvre joined the Directorate as Special Advisor for IJC Obligations and Research. He assists the Regional Director by representing the Directorate on several IJC Boards and Committees. He also advises the Regional Director on research needs of the Region. Currently, he is the Study Coordinator for the Lake Erie Regulation Study, the Chairman of the Implementation Committee of the Water Quality Board, and Chairman of the Canadian Section of the Research Advisory Board.

The office of the Regional Director, Ontario Region, Inland Waters Directorate was officially relocated on September 6, 1977, from 135 St. Clair Avenue West, Toronto to the Canada Centre for Inland Waters, Burlington. This move will provide for more effective coordination and liaison between research activities at the Centre and IWD, Ontario Region operations.

The Operational Performance Measurement System (OPMS) was implemented in the analytical services laboratory of the Water Quality Branch and the hydro-metric data collection activity in the Water Resources Branch. The first comparison data will be available at the end of March 1978.

The Directorate participated in the Departmental A-Base Review in 1977. The bulk of the required documentation was completed and forwarded to the Departmental A-Base Review Task Force by the end of 1977. Interviews with the Task Force will take place early in the new year.

11.0 Publications and Presentations

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Water Resources Branch

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Water Planning and Management Branch

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"Evaluation of Flood and Erosion Benefits for the Great Lakes Shoreline Management Study", Discussion Paper presented at the Workshop on Economics of Flood Damage Reduction, Ottawa, July 5, 1977.

"The Hydrology of Lake Ontario", Paper presented at the International Field Year for the Great Lakes Symposium at the International Society for Limnology Congress, Copenhagen, Denmark, August 1977.

"Report to the International Niagara Board of Control on the 1976-77 Operation of the Lake Erie-Niagara River Ice Boom and Related Studies", International Niagara Working Committee, December 1977.

Policy Research and Social Analysis Division

Leah, T. D. "The Production, Use and Distribution of Phthalic Acid Esters in Canada", Environmental Contaminants Inventory Study No. 4, Report Series No. 45, Inland Waters Directorate, Department of Fisheries and the Environment, Burlington, Ontario, 1977.

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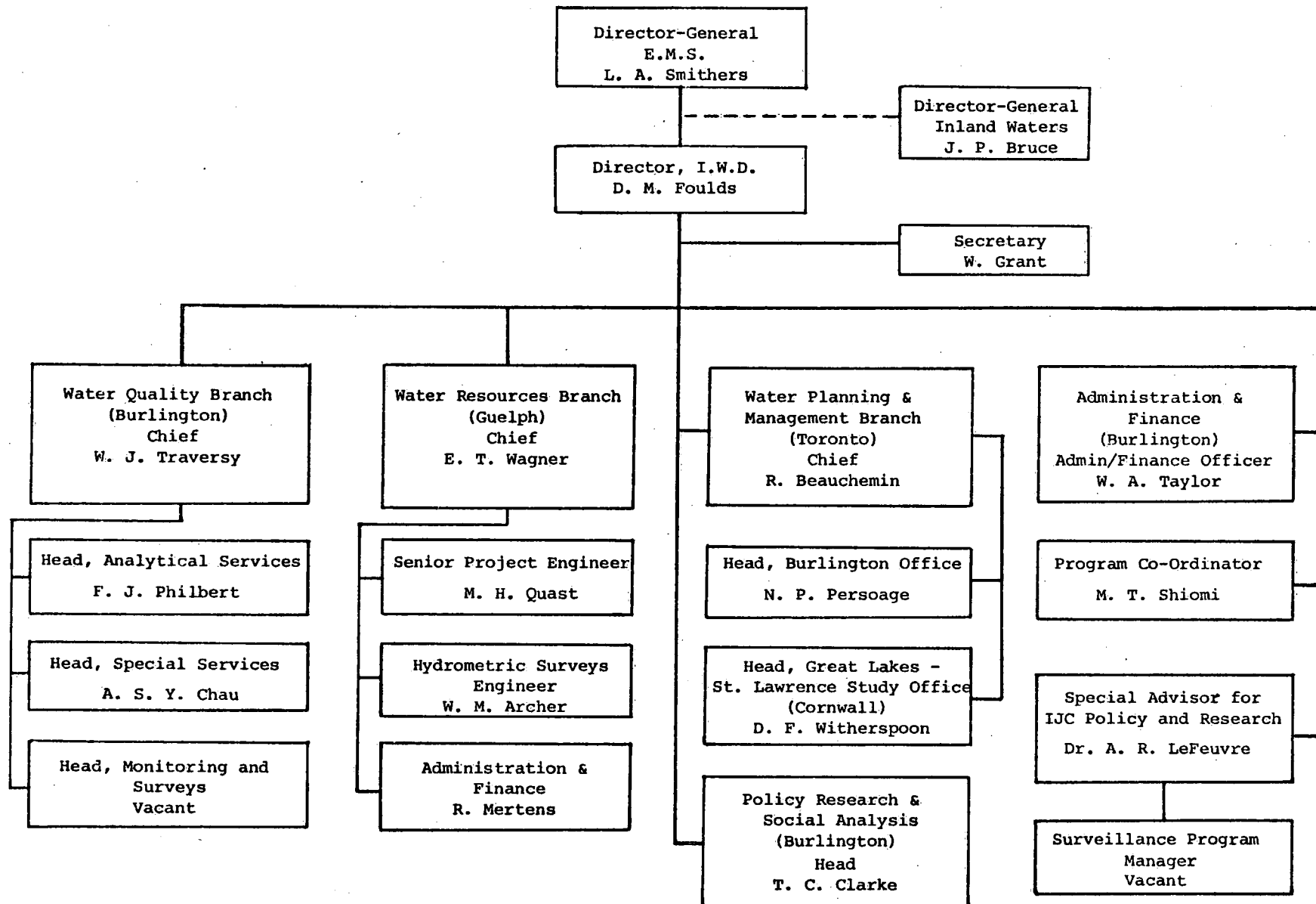
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December 31, 1977

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