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ANNUAL REPORT 1979 INLAND WATERS DIRECTORATE ONTARIO REGION



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DEPARTMENT OF THE ENVIRONMENT

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**Inland Waters Directorate
Ontario Region**

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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.

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&MB) administers and implements federal, federal-provincial, and international water management projects. The Branch provides technical support to all the International Joint Commission's (IJC) 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 inter-connecting channels.

The Water Quality Branch (WQB) carries out monitoring and surveillance activities in the Great Lakes and connecting channels; maintains an analytical chemistry 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 the Environment. The following is a description of the activities carried out within its program structure during 1979.

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

Activities of man and the natural ecosystem in the Great Lakes – St. Lawrence system basin are significantly affected by water level fluctuations in the lakes and their connecting channels. The variations of these lake water levels and channel flows have been recognized by the Governments of Canada and the United States as an important boundary issue, affecting power production, navigation, shore erosion, fisheries, recreation and potable water supplies. The IJC was established in 1909 by the two governments to seek common solutions in their 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 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 Water Planning and Management Branch of 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 water level of Lake Superior was below normal at the beginning of the year. However, high water supplies commencing in February caused the water level of that lake to be slightly above normal for the rest of the year. The unregulated Lakes Michigan, Huron, and Erie remained about 1 foot higher than normal during the year. On Lake Ontario, the water level remained slightly above normal throughout the year.

Technical support was provided by WP&MB to the Commission's International Niagara Board of Control regarding water level control activities in the Lake Erie-Niagara River area. The Branch monitored the operation of the Lake Erie-Niagara River Ice Boom, carried out related studies, and contributed to a public information brochure on the ice boom. Public meetings on the operation of the ice boom are held annually. The Branch, as well, 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.

In October, 1979, the IJC amended its 1914 Orders of Approval for the regulation of Lake Superior. As a result, the Superior Board implemented Regulation Plan 1977. This plan considers both the levels of Lake Superior and Lakes Michigan-Huron in determining the outflows of Lake Superior. During the year, the WP&MB also provided extensive support to the IJC and Lake Superior Board with regard to the proposal by the Great Lakes Power Company to re-develop its power facilities at Sault Ste. Marie, Ontario. Directorate staff participated with other agencies in the development of water quality tolerance limits to be adhered to during construction of these new power facilities. Toward the end of 1979, the Board also commenced pre-discharge on Lake Superior to facilitate scheduled Great Lakes Power Re-development activities.

During 1979, WP&MB supported the St. Lawrence Board in conducting a study to determine if improvements in Lake Ontario regulation were possible. Other water management activities included monitoring the operation of the ice booms in the St. Marys and St. Lawrence Rivers and participating in planning for a non-destructive testing program of the Lake Superior Compensating Works Structure. International studies related to the extension of the navigation season in the Great Lakes – St. Lawrence River system were monitored by the Directorate.

The Directorate also monitors others Canada – U.S. boundary water issues such as the state of Illinois' Application to the U.S. Supreme Court to modify the Chicago diversion accounting procedure, and the conditions of Terrapin Point at Niagara Falls where a massive rock fall and dam failure were predicted by a psychic in the summer of 1979. Although this predicted incident did not materialize, it focussed international attention on the Niagara area.

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 regulation of Lake Erie; and b) the International Great Lakes Diversions and Consumptive Uses Study Board to examine the effects of existing and proposed diversions and consumptive uses on Great Lakes water levels and flows. The Water Planning and Management Branch, Ontario Region, and its Headquarters in Ottawa provided extensive support to these two reference studies during 1979.

Inland Waters Directorate, Ontario Region, provided the Canadian Chairmen and Secretaries to the Lake Erie Study Board and Working Committee. The Directorate also provided Chairmanships to five of eight Subcommittees, namely: Regulation, Regulatory Works, Coastal Zone, Environmental Effects, and Economics.

Considerable progress was made in the Lake Erie Study in 1979. The Working Committee implemented its public information program and the first newsletter was mailed to public interest groups in Canada and the United States. The Regulatory Works Subcommittee prepared preliminary engineering designs and cost estimates for regulatory works at the head of the Niagara River and regulatory/remedial works in the St. Lawrence River. The Regulation Subcommittee developed data on water levels and flows for the Great Lakes system as a "basis-of comparison" against which levels and flows of alternative Lake Erie regulation plans will be compared. Regulation plans and resulting data on lake levels and flows for the first two categories of the 4-category regulation study have been defined. The Coastal Zone Subcommittee developed methodologies for evaluating the effects of Lake Erie regulation plans on shoreline flooding and erosion. The Environmental Effects Subcommittee developed methodologies for evaluating the effects of regulation on water quality, fisheries, wildlife, recreational beaches, and recreational boating. The Economics Subcommittee reviewed and coordinated the economic components of the methodologies of the different subcommittees to ensure compatibility for project feasibility assessment.

By year end, the Lake Erie Study Board had completed most of the economic evaluation of its Categories 1 and 2 regulation plans. The Lake Erie Study Board also assisted the Diversions and Consumptive Uses Board as well as the St. Lawrence Board in conducting the economic evaluation of plans and alternatives developed by these Boards.

Water Planning and Management Branch contributes to the International Diversions and Consumptive Uses Study Board by providing the Canadian 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 (WRB), operates and maintains 37 water level stations on the Great Lakes beginning at Thunder Bay and downstream on the St. Lawrence River as far as Summerstown, for the Canadian Hydrographic Service (CHS). As a result of dis-

cussions between the WRB and the CHS on the division of responsibility for these and other tides and water level gauges operated by WRB for the CHS, it is anticipated that WRB will assume ownership of these 37 water level stations. Responsibilities for the processing and publication of the data and the operation of the real-time data equipment are still to be resolved.

During September the Point Pelee East station was re-activated with the installation of a servo-manometer gauge to replace a damaged intake pipe on the existing well. A site has been finalized for the location of a new water level station beside the government dock on the St. Lawrence at Brockville. The station will be constructed in early 1980.

Work continued on the replacement of the Telex gauging system installed at 13 stations. Seven (7) additional "Data Acquisition and Telemetry System" (DATS) units were installed during 1979. There are now a total of 11 (eleven) of these units in operation. The DATS recorder has a solid-state digital memory for temporary storage of water level data at the gauge site.

Work has begun on the report entitled "History of Water Level Gauges, Lower Great Lakes and International Section of the St. Lawrence River". The report will update the previously published histories and also include any new gauges installed. The report will be in the same format as the 1978 report "History of Water Level Gauges, Upper Great Lakes and St. Clair-Detroit Rivers", however, present controlling benchmarks will be shown in metric followed by imperial units in brackets.

Personnel from WRB participated with personnel from National Oceanographic and Atmospheric Administration's Environmental Research Laboratory, Ann Arbor, Michigan, in the placement of Marsh McBirney Model 585 recording electromagnetic current meters in the St. Clair River at Port Huron, Michigan, just below the Bluewater Bridge. The output of these meters after calibration are to be used to compute the St. Clair River discharges under ice conditions. Should this method prove successful at this site, another set of meters will be deployed to calculate the winter discharges in the Detroit River. To-date, due to meter breakdown problems, no useful data have been extracted. It is anticipated that these problems will be overcome in 1980.

On behalf of the Working Committee of the International Niagara Board of Control, work is continuing on the development of a stage-discharge relationship for the Ashland Avenue gauging station on the Niagara River at Niagara Falls, New York. The work consisted of statistical analyses of several proposals

for a revised rating, preparation of graphs and the first draft of a report.

3.0 Great Lakes Basin Water Pollution Program

The Great Lakes represent 80 percent of the North Americans' supply of surface fresh water. They sustain life, commerce, industry, and recreation for an estimated 37 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.

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 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 control of 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. Inland Waters Directorate, Ontario Region 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 pollution 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 exten-

ded 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 Canada-Ontario Agreement also provides for the cost-sharing of provincial surveillance activities on a 50-50 basis. In the 1978-79 fiscal year Canada's share of surveillance costs under the Canada-Ontario Agreement amounted to \$686,979.

In recognition of the added responsibilities for Canada under the 1978 Canada-U.S. Agreement, Canada and Ontario initiated the renegotiation of the Canada-Ontario Agreement in 1979. The revised Canada-Ontario Agreement which will reflect the new requirements of the 1978 Canada-U.S. Agreement should be completed and signed in 1980.

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

In support of the Canada-U.S. Great Lakes Water Quality Agreement, the Directorate's Water Quality Branch continued in its lead role in conducting the operational aspects of the open lake surveillance project. Lake surveys were designed to identify violations of water quality objectives, assess open lake water quality responses to remedial programs, identify trends in water quality and detect emerging problems.

Water Quality Branch participated in twelve water quality cruises carried out on Lakes Ontario and Erie during the year. Nine of these cruises, each of which involved the sampling of 94 stations, were conducted in Lake Ontario during the period between March 21 and November 23. A total of 1849 samples were analyzed on board ship for 5547 tests and an additional 3876 samples were analyzed in the main laboratory at Canada Centre for Inland Waters (CCIW), for 34,168 tests. The Lake Erie studies consisted of time series sampling at each of two stations for forty-eight hour periods. Three cruises were completed during the period between June 15 and August 13 in support of special studies initiated by the National Water Research Institute (NWRI). A total of 693 samples were analyzed on board ship for 2079 tests and 3034 samples were analyzed in the main laboratory for 20,302 tests.

3.2 *Connecting Channels Water Quality*

Water quality monitoring continued in two connecting channels, the Niagara and St. Lawrence Rivers. Automatic water samplers at Niagara-on-the-Lake and Wolfe Island collected daily water samples for estimating loadings in and out of Lake Ontario. In

response to the concern expressed regarding chemical waste dumping in the Upper Niagara River, the sampling frequency for suspended sediments was increased to one sample per week at the Niagara-on-the-Lake site. Preliminary results indicated that significant amounts of persistent contaminants are associated with the suspended sediments and are being carried into Lake Ontario.

Water quality surveys were also conducted on the Upper Niagara River to complement the sampling program at Niagara-on-the-Lake. Water Quality Branch staff carried out eleven surveys between the period from May 6 to December 6. Each survey involved the sampling of 24 stations. A total of 284 samples were collected for 7920 tests. Additional water samples were collected on six of the eleven surveys for persistent organic contaminants analysis.

3.3 Atmospheric Loadings

Inland Waters Directorate continued to fulfill its commitment to measure atmospheric loadings to the Great Lakes as part of the IJC Great Lakes Surveillance Program, by maintaining its fifteen precipitation chemistry stations on the Canadian side of the basin. Of the fifteen stations within the network, eleven were equipped with automatic precipitation samplers, two had bulk samplers only and four were equipped with both types to permit intercomparison of the two sampling modes. This year the network was reviewed by examining past data and resulted in some minor modifications in sampling locations and sampling procedures. These changes were also made to coordinate the network with existing networks operated by other agencies so as to permit valid data comparison. Atmospheric loading estimates to the Great Lakes were reported to the IJC Surveillance Subcommittee.

3.4 Analytical Laboratory Support

Analytical support services were provided by WQB to over 60 studies and projects related to programs of the federal government, the IJC, and other agencies. A total of some 25,000 samples consisting of water, wastewater, precipitation, sediments, fish, and other aquatic biota were analyzed for 228,000 test results.

4.0 Great Lakes Shoreland Management and Damage Reduction Program

High water levels and storms can cause considerable flood and erosion damage along much of the lower

Great Lakes shoreland such as that which occurred in 1973-74. Canada and Ontario carried out a major survey of the shoreland in 1973-74 to assess the nature and extent of this damage and to recommend remedial measures. The resulting Technical Report of the Canada-Ontario Great Lakes Shore Damage Survey, as released in 1976, contained a number of recommendations for follow-up programs including: establishment of a public awareness program to better inform the public of the risks of building near the shore; establishment of 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, provide the membership for this Task Force which has been carrying out these follow-up programs.

4.1 Public Awareness of Great Lakes Shoreland Problems

Water Planning and Management Branch provided funds and technical support to a public awareness program on the problems of living in the shore zone. A brochure entitled "Shore Property Hazards", intended as a guide for present and potential shoreland residents, was distributed to the public. Previously-published brochures were also made available to the general public, and a French-language edition of the brochure on the Use of Canada-Ontario Great Lakes Flood and Erosion Prone Area Mapping was published.

A Canada-Ontario display on the federal-provincial shoreland management program on the Great Lakes was shown at the Toronto International Boat Show from January 12 to 21, 1979; at the CCIW Open House from April 20 to 22, 1979; and at the Canada Water Resources Association (CWRA) Conference in Ottawa from May 30 to June 1, 1979. The display entitled "Coping With the Great Lakes" describes the programs that have been undertaken by the two governments on the Great Lakes shore. The display was manned by WP&MB staff with assistance from the Department of Fisheries and Oceans and the Ontario Ministry of Natural Resources.

A slide-tape show, depicting the hazards of locating in the coastal zone, was prepared and shown at the CWRA Conference in Ottawa. Copies of the show will be distributed to conservation authorities for their use at local meetings.

4.2 Great Lakes Shoreland Erosion Monitoring

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

4.3 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. Water Planning and Management Branch has been active in the development of methodologies for evaluating the cost and benefits of strategies for reducing flood and erosion damage and for evaluating the environmental impacts of shoreland developments. Draft reports of these methodologies have been completed and assembled in the form of a Shore Management Guide. It is expected that reviews and modifications to the methodology and this Guide will be complete so as to permit publication of the Guide in mid-1980. An 18-mile reach of Lake Erie shoreland in Essex County was chosen for intensive study in order to develop alternatives and to test the application of the methodologies to a specific study site. A report on their application will also be available in 1980.

5.0 Flood Damage Reduction Program

The federal government is committed to alleviating human suffering and minimizing damage caused by floods through strategies such as identifying high flood-risk areas, discouraging new investments in such 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, is involved in two projects with the Province of Ontario to reduce flood damage. The first project is designed to reduce future flood damages across the province by identifying and mapping the hazardous areas and discouraging further development in these areas. The second project concerns flood protection of the agricultural lands in southwestern Ontario.

5.1 Flood Damage Reduction

The mapping of flood-risk areas is a prerequisite to the Flood Damage Reduction program. The information arising from this activity 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 which includes 6 years for mapping.

In accordance with the Agreement, a Steering Committee, with representatives from IWD, Ontario Region and Headquarters, has been established and a Technical Subcommittee, supported by WP&MB, was formed to carry out the technical aspects of the program.

As the Agreement is retroactive to April 1, 1977, the Steering Committee selected and reviewed four projects undertaken by the Province in 1977-78 to ascertain whether past provincial studies meet the guidelines set up for the Agreement. Two of the four projects fully met the technical specifications of the Agreement. The Province is now including the technical Schedules B and C of the Agreement in requests for proposals for future flood risk mapping work to be undertaken through its Conservation Authorities Branch.

The Province has identified completed projects representing the sum of \$377,456.34 to be applied against the federal advance of \$643,243.56 for projects undertaken in 1977-78 and 1978-79. The balance of this federal advance has been applied against projects undertaken in fiscal year 1979-80 which are estimated to total an expenditure of \$1,102,600.

Flood risk maps and an accompanying brochure for the Oshawa pilot study were officially released on October 16, 1979, 25 years following the day that Hurricane Hazel swept southern Ontario. The maps were distributed to the Conservation Authority and local residents.

The public awareness program was intensified by WP&MB through further distribution of the brochure "Cutting Our Flood Losses", modification and subsequent distribution to conservation authorities of the audiovisual slide show on the subject prepared by IWD Headquarters, and the development of a panel display to highlight the basic theme of the program.

Following extensive flooding in the Sturgeon River/Lake Nipissing/French River basin during the spring of 1979, the Steering Committee initiated a study under this program to seek solutions that could reduce the threat of future flooding in the watershed. This comprehensive study administered by WP&MB and the Ontario Ministry of Natural Resources for the Steering Committee, will cost approximately \$300,000. An interim report is due in April, 1980, and a final report in December, 1980. In addition to mapping of flood-risk areas, the Terms of Reference for the Study call for evaluations of reservoir operations, flood-forecasting procedures, alternative structural flood control measures, and other structural and non-structural measures that could reduce future flood damages in the area. A broad public information program is also included in the study.

5.2 *Southwestern Ontario Agricultural Land Dyking*

Under the Southwestern Ontario Agricultural Land Dyking Agreement between Canada and Ontario, work was completed on the dyking projects along the lower Thames River and its tributaries and along the low-lying shorelines of Lake St. Clair in Dover Township.

A frequency analysis of water levels in Chenal Ecarte, which empties into Lake St. Clair, was completed and a report published by WP&MB. A review of the environmental impact of the dyke in the Dover Marsh area was prepared and published by the Branch. Based upon the recommendations of the Auditor General of Canada in the report "Study of Procedures in Cost Effectiveness" (SPICE), work began on post-project evaluations of the economic feasibility of several dyking projects. The results of this review will be published by PR&SA in 1980.

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 specific 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. The sharing of costs under the Agreement is based on this classification of stations.

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.

Another important aim of the Water Management Program is to ensure that reliable and useful chemical 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.

6.1 *Hydrometric and Sediment Surveys and Analysis*

The Water Resources Branch operated a hydrometric network of 341 stations in Ontario as of April 1, 1979, 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 fifth year of the Canada-Ontario Cost Share Agreement on Water Quantity Surveys. Of the 341 stations involved, 137 stations were designated as Federal, 29 stations as Federal-Provincial, 166 stations as Provincial, and 9 stations as Provincial-Provincial.

Spring runoff during 1979 in several areas of Ontario was extremely high. The heavy rain in the Upper Ottawa River watershed on April 25 and 26 resulted in near record levels, the Ottawa River at Britannia gauge recording a peak of 197.77 feet (60.280 metres) on May 1, the second highest reading

for the period of record 1915 to-date. The highest peak was recorded at 197.90 feet (60.320 metres) on May 15, 1928. There were numerous incidents of flooding along the Ottawa River, including Fort Coulonge and Constance Bay.

Above normal spring rains caused high water levels throughout the Trent River System. Flood advisory notices were sent out to several areas along the system. Warnings of high velocity and turbulent waters were issued to boaters.

Heavy ice jams in the Lower Thames River system at Lake St. Clair caused water levels to breach the dykes and resulted in extensive flooding of low lying areas. Although no loss of life occurred, severe damage to buildings and fields were reported and several cattle drowned. Water Resources Branch field crews and office staff provided data to both provincial and federal authorities concerned with the flooding.

Spring runoff in Northern Ontario, combined with heavy rainfall during last April, resulted in extreme high flows in Northern Ontario. Record high flows were recorded and measured on the Mattagami River, North French River and Moose River. The Moose River was measured at 295,000 cfs. (8350 cms.) exceeding the previous maximum recorded instantaneous flow of 250,000 cfs. (7080 cms.) set in 1960. Severe flooding in the little hamlet of Field about fifty-five kilometres northwest of North Bay left losses estimated at three million dollars residential and seven million dollars commercial. Staff of the North Bay sub-office, WRB carried out a short term emergency discharge measurement program of the Sturgeon River at the request of the Ministry of Natural Resources. Results were processed and forwarded to the Ministry who transmitted them to Ontario Hydro and other agencies. The extremely high Sturgeon River inflows to Lake Nipissing caused near record flooding in the communities of Callander and West Ferris. A major dyking program minimized the damage in the east end of North Bay. The Department of Public Works opened control structures on the outlet of Lake Nipissing in an effort to alleviate some flooding.

As a result of the extensive flooding in Northern Ontario during 1979, the Ministry of Natural Resources decided to expand their Flood Warning and Flow Forecasting System in Northern Ontario. At their request, WRB staff constructed two new hydrometric stations with walk-in shelters and converted Guelph (look-in) shelters to walk-in types at two sites. Nine (9) Labarge satellite data collection platforms (DCP's) will be installed during 1980 at these four sites as well as at five other existing walk-in

shelter sites. Water level data from these sites will be available on a real-time basis via satellite retransmission.

Staff from North Bay and Guelph offices, WRB carried out a discharge measurement program on the French River System to re-evaluate the current stage-discharge ratings used to regulate flows. Measurements were taken at the control structures at the outlet of Lake Nipissing and at the Dry Pine Bay locations. Flows were manipulated by the Department of Public Works to accommodate the meterings. The program was requested and funded by the Department of Public Works and results will be used to check the relationships of outflows calculated during the May 1979 flooding in the Sturgeon River and Lake Nipissing areas.

Plans have been finalized for the construction of two hydrometric gauging stations on behalf of Transport Canada at the Mount Hope Airport at Hamilton during January 1980. These stations are an integral part of a composite water monitoring program leading to the preparation of an Environmental Impact Statement for the proposed expansion of the airport. It is envisaged that the monitoring program will continue for four to five years and will cover the quality and quantity of airport runoff to the receiving streams.

One new hydrometric station was constructed in connection with the Long Range Transport of Atmospheric Pollutants (LRTAP) study in the Turkey Lake basin north of Sault Ste. Marie. Four more stations will be installed in the spring of 1980. Discharge measurement programs at all five sites commenced in November.

During 1979, the WRB took approximately, 2200 discharge measurements in Ontario. Eleven (11) water quality samples were collected and sent to the WQB 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 all water level recording gauges (with the exception of 5 Exactel gauges which will not be converted) was completed during 1979.

A sediment laboratory was fully operational in Guelph during 1979. Approximately, 1160 sediment samples were collected and analyzed. Types of analysis included total sediment concentration, bottom withdrawal and bed material.

6.2 Construction

The Construction Program for 1979-80 consisted of the installation of two weirs, nine hydrometric and one water level gauging stations (eight with walk-in

shelters and two with "Guelph" shelters), two gauging station shelter replacements (one destroyed by fire and one destroyed by a truck), and two shelters converted from "Guelph"-type to walk-in for DCP purposes. In addition, twenty-five field investigations were made and two discontinued hydrometric stations were dismantled. Major repairs and maintenance such as updating and repairing electrical services, repairing cableways, repairing weirs damaged during spring freshets, installing thermostats to control heating units, and repairing gauge house doors and roofs damaged by vandals were also carried out.

6.3 Training

The 1979 Water Resources Branch, Ontario Region Workshop was held the week of November 5-9 in Guelph for all staff. The agenda included a one-day Supervisor's meeting; a Safety Committee meeting; an address by Mr. J.E. Slater, the Director of the WRB; a one-day technical "hands-on" workshop on water level instrumentation; a presentation on various personnel items given by Mr. Ray Jackson, Downsview; the Employee Assistance Program Supervisor Awareness workshop; and a general staff meeting.

A number of foreign officials visited the Guelph office of the WRB. Two Columbian hydrologists received training at the Guelph office during February. The training concentrated on hydrometric computational procedures and automated data processing. In April, two Peruvian government officials with the Direccion General de Transporte Acuatico (D.G.T.A.) visited the Guelph office where the operations and functions of the Water Survey of Canada were explained. In July Mr. Joseph Mrutu, hydrologist with the Ministry of Water, Power and Minerals, Dar Es Salaam, Tanzania visited the Guelph office. Discussed were hydrometric computational procedures, sediment discharge measurements and related office computations. In September, three members of the Faculty of Engineering, University of Lagos, Nigeria, met with staff members of the Guelph office. They were briefed on techniques and methods for producing water resources data. This information will assist them in setting-up a water resources data bank system in Lagos.

6.4 Data Control, Publication, and Distribution

During the period January - December 1979, over three hundred and seventy-five data requests involving in excess of two thousand three hundred station years of record were answered.

The annual publication "Surface Water Data -

Ontario - 1978" was published and distributed by IWD, to approximately 400 addresses on the mailing list.

The Water Resources Branch and the Atmospheric Environment Service (AES), co-hosted a Data Users Workshop at AES headquarters, Downsview, on November 14, 1979. The Workshop informed over seventy data users of the types of hydrometric and hydrometeorological data that are available and how to obtain them. A panel discussion allowed users a chance to voice their needs, concerns or problems with respect to data acquisition and the types of data they require.

6.5 Network Planning and Evaluation

As part of the network planning and evaluation process, the National Weather Service River Forecasting System, Modified Stanford Watershed Model was adapted to the computer facilities at the University of Guelph. The model is being calibrated for the Kenogami River basin in Northern Ontario. With the use of this model and others, the Ontario Region network will be evaluated for the addition or deletion of hydrometric stations.

6.6 Water Quality Methods Development and Quality Control

In the continuing service and support to the WQB regional laboratories, several new methods were developed: a method for the determination of nine trace metals in fish tissue; methods for the recovery, cleanup and separation of kepone, mirex and photomirex in water and sediments; and investigation of the stability of arsenic, selenium, herbicides, PCBs and carbamates in waters and sediments.

In its role as national coordinator of both method development and quality control programs in all the WQB regional water quality laboratories, WQB, Ontario Region, prepared several bulk sediment standard reference materials. These samples are currently undergoing rigorous analysis to certify them for several parameters including trace metals, PCBs, and pesticides. In the future, they will be used in the standardization of analytical methods for routine monitoring, method development activities, in-house calibration of instruments and methods and interlaboratory quality control studies.

The quality control program in the WQB laboratories comprises several types of studies: the national interlaboratory quality control program (90 labs), the inter-regional program (5 regions), and the International Joint Commission program which includes

twenty laboratories which contribute data to various IJC Surveillance projects. Special quality control studies are coordinated with agencies such as the American Society for Testing and Materials, the Association of Official Analytical Chemists and the Federal Interdepartmental Committee on Pesticides.

Several national quality control studies involving the analyses of trace metals and organic contaminants were conducted. Of particular note was the study on PCBs in wet sediments, the first study of its kind. Studies for the IJC surveillance laboratories involved trace metals, major ions and nutrients in water and PCBs in fish and sediments. In addition to the regular monthly inter-regional program, WQB was heavily involved in the design and execution of special inter-regional quality assurance studies to generate inter-laboratory specification data on precision, accuracy and detection limits for parameters in the Water Quality Branch Analytical Methods Manual. These data should prove to be especially useful in determining the degree of confidence to which WQB laboratory data may be interpreted.

7.0 Toxic Substances Program

The deleterious effects of toxic materials such as mercury, lead and PCBs on the environment are of major concern considering the ultimate impacts on the socio-economic welfare and health of society. The presence of these substances in the environment may seriously affect plant and animal life including man. Contaminated water is limited in its use unless costly pretreatment is employed. Contaminated fish, birds, and other animals may become unfit for human consumption resulting in unemployment and loss of revenue for some industries. There may also be serious adverse effects on recreational activities and industries including sport fishing, swimming, and hunting.

The federal government has recognized the importance of the toxic substances problem and its national scope through the enactment of the Environmental Contaminants Act in December 1975. The Act is one basis for federal involvement with the toxic substances issue. Federal involvement is also called for because recent studies by the Upper Lakes Reference Group (ULRG) and the Pollution from Land Use Activities Reference Group (PLUARG), of the IJC have strongly suggested that long range atmospheric transport, is an important route for the entry of toxic substances to the environment. This often involves pollution crossing provincial and international borders.

7.1 Long Range Transport of Atmospheric Pollutants

The Water Quality Branch provided field assistance and laboratory analytical support to a joint Atmospheric Environment Service – Water Quality Branch National Atmospheric Precipitation Sampling Network. The purpose of the network is to provide data on the quality of precipitation and its potential impact on aquatic and terrestrial ecosystems. There are a total of 49 stations in the network at the present time. During the year, several hundred samples were collected from the network and analyzed for a variety of toxic metals and organic contaminants. The Water Quality Branch's NAQUADAT (National Water Quality Data Bank) data system is used to store the data from the network.

7.2 Laboratory Support

The Water Quality Branch laboratory provides analytical support to a number of studies related to the Toxic Substances Program. During 1979, over 1,000 fish, plankton and sediment samples were analyzed for toxic metals and/or trace organic contaminants. The acquisition of an inductively coupled argon plasma (ICAP) quantometer was a noteworthy development in 1979. This instrument has the capability of analyzing simultaneously for several different elements from a single sample. Although the quantometer has already been used for the analysis of several samples further method development will be required before its full capacity is achieved.

8.0 Environmental Assessment and Baseline Information

With the 1973 Cabinet Directive and creation of the Environmental Assessment and Review Process (EARP), the federal government established the protection of environmental quality as a legitimate objective in all undertakings with federal involvement. Development projects such as airports, marinas, harbours, power plants, sewage treatment plants, and linear constructions (i.e., pipelines) are required to pass through the EAR Process before federal support or funding is given. The Environmental Assessment and Baseline Information Program provides direct support to EARP in ensuring that environmental effects are taken into account early in the planning of projects and that the results of the review are used to minimize adverse environmental impacts of the project. The program is further concerned with the

development of methods for effective environmental assessment and the provision of the information and knowledge base required for evaluating the effects of various activities on the environmental resources of specific geographical areas to various government agencies and the public.

During 1979, IWD, Ontario Region was involved in a number of areas relating to environmental assessment. The evaluation of environmental effects was carried out on projects such as the Oshawa Harbour landfill, Chenal Ecarte/Sydenham River dredging and disposal, Bell River Power Plant - Michigan, Big Creek National Wildlife Area dyking, and draft waterfront plan of the Regional Municipality of Halton. In addition, Public Works Canada Area Screening reports for Cornwall, Peterborough, Hamilton, and Thunder Bay were reviewed for potential environmental concerns.

A staff member of WP&MB completed service on the Environmental Assessment Panel for the proposed new Eldorado Nuclear Limited (ENL) uranium refinery. The Panel concluded that any of the three prospective sites (i.e., Blind River, Dill Township, Hope Township) would be environmentally acceptable, subject to constraints specific to each site. The final preference by Eldorado was for the Hope Township site, several kilometres to the west of the existing Port Hope refinery. Inland Waters Directorate, Ontario Region is now participating with other Department of Environment (DOE) Services and ENL in setting-up pre-construction/operation monitoring and baseline studies. Other projects involving monitoring studies included Great Lakes Power on the St. Marys River and Southeast Bend Cut-Off dredging.

The Hudson Bay Lowland project was initiated in 1975 to collect and interpret environmental baseline data in order to establish an information base necessary for evaluating impacts from future development in the north. The acquisition of water quality data continued for four new stations located on the Albany, Attawapiskat, Winisk, and Severn Rivers, and a water resources literature review was completed for the Hudson Bay Lowland. Initial preparations are now underway for a baseline study of Oshawa Second Marsh which is being proposed as the site for expansion of Oshawa Harbour and ancillary developments. The latter study is an Ontario Region initiative under the DOE Baseline Study program and is being coordinated by the Lands Directorate, Ontario Region.

In connection with Great Lakes Shoreland Management, environmental evaluation matrices were de-

veloped as a methodology to be used, by shore managers, in screening and assessing the effects of shore management alternatives. A background paper was also prepared on the concepts and activities of a redefined environmental assessment and baseline information program.

9.0 Information Services

One of the important functions of IWD, Ontario Region is the dissemination of the information generated by its various programs. There is usually a primary client or user of the information from the programs such as the IJC or its Boards and Committees, provincial water resources agencies, water utilities and other federal government departments. However, in addition to these specific users there is a need to inform the general public about the state of the water environment and about the contribution of IWD, Ontario Region to the wise management of the water resources of Ontario. A variety of informational materials and approaches are used to inform the public, such as brochures and pamphlets on specific programs or issues, technical demonstrations or seminars and displays at public events. There is also the day-to-day transfer of information by scientists, engineers, and managers in IWD, as they answer queries from the media or general public, participate in public forums, and issue technical reports.

9.1 CCIW Open House

All units of IWD, Ontario Region, located at the Canada Centre for Inland Waters (CCIW), participated in the CCIW Open House held on April 20-22, 1979. Over 20,000 visitors attended the Open House. The Policy Research and Social Analysis Division conducted a survey of the visitors to determine their reaction to the Open House. The survey indicated that 85 percent of the visitors improved their knowledge of the environment as a result of their visit and that 99 percent of the visitors judged the Open House worthwhile.

9.2 Displays

Inland Waters Directorate, Ontario Region, again participated in the Government of Canada display at the Toronto International Boat Show - January 12-21, 1979. This year WP&MB's display theme was "Coping with the Great Lakes", which dealt with water level fluctuations, shore erosion, and flood problems on the Great Lakes. An audio-visual presentation on the Canada-Ontario Flood Damage

Reduction Program was also included. The Water Quality Branch installed three Auto-analyser systems for the Boat Show display. Their exhibit included panels carrying printed material outlining the objectives of the WQB and pictures depicting aspects of its laboratory and field activities. The Water Resources Branch's Boat Show exhibit consisted of types of analogue and punch tape recorders, telemetry instruments and field equipment used by WRB for the collection of water level and discharge data. Samples of its various publications were displayed and a handout entitled: "Uses of Water Resources Data", was very popular.

The Water Resources Branch participated with the Metro Toronto and Region Conservation Authority in a display at the 1979 Canadian National Exhibition. The theme of the exhibit was Water Management and Flood Warning. Hurricane Hazel was used as an example of a flood event to illustrate the purpose of the water management practices and the flood warning system. The Branch provided a standard look-in instrument shelter atop a four foot well having a plexiglass front window. The shelter housed an A-35 water level recorder and telemark. The telemark provides a coded water level reading when called up from any telephone. A phone was provided at the exhibit so that visitors could call up the telemark and listen to the code.

The Water Planning and Management Branch prepared two slide-tape shows – "Coping with the Great Lakes – Flooding and Erosion", presented at the Toronto International Boat Show, CCIW Open House and the Canadian Water Resources Assoc. Conference (CWRA) and "Cutting Our Flood Losses", presented at the CWRA Conference. The latter slide-tape show is now being distributed to conservation authorities on request while the former show will be available for distribution in 1980.

9.3 Information Material

The Water Planning Management Branch participated in or produced the following public information publications: "Lake Erie Water Level Study" – the first newsletter reflecting the IJC's Lake Erie Study; "Lake Erie-Niagara River Ice Boom" – distributed in the Fort Erie, Niagara Falls and Buffalo area; "Shore Property Hazards" – issued to conservation authorities and made available to the general public; "Oshawa Flood Risk Maps and Brochure" – issued to the conservation authority and local residents; and "Guide d'utilisation des cartes de la zone touchée par les inondations et l'érosion dans le secteur Canada – Ontario des grands lacs" – issued to conservation

authorities and the general public.

Policy Research and Social Analysis Division prepared an "Environmental Values Game" – which is designed as a teaching aid for high school teachers. About 2,000 copies of the game were passed out to teachers at the CCIW Open House.

9.4 Other Information Activities

Water Resources Branch staff members gave a demonstration for Sir Sanford Fleming College students on stream measurement techniques at the Beaverton River hydrometric site. Three presentations were given students of the Fergus District High School, explaining the activities of the Branch.

10.0 Management and Administration

As of April 1, 1979 a new reporting relationship came into effect for IWD, Ontario Region. This resulted from a reorganization within the Department of the Environment which eliminated the office of the Regional Director General, Environmental Management Service (RDG-EMS), Ontario Region and established the office of the, Regional Director General, Environment Canada (RDG-DOE), Ontario Region. Included in this reorganization was a change in line authority for IWD, Ontario Region from the RDG-EMS, Ontario Region to the Director General, IWD, located in Ottawa. Functional advice and guidance and personnel support are received from the RDG-DOE, Ontario Region headquartered in Toronto. The organization chart on the last page of this annual report shows the new reporting relationship.

In 1979, the Directorate administered and managed resources amounting to 5.37 million dollars and 118.4 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 1979 included the Canada-Ontario Great Lakes Water Quality Agreement funding (\$1,200,000.) and the Canada-Ontario Flood Damage Reduction Agreement funding (\$117,000. paid in 1979-80).

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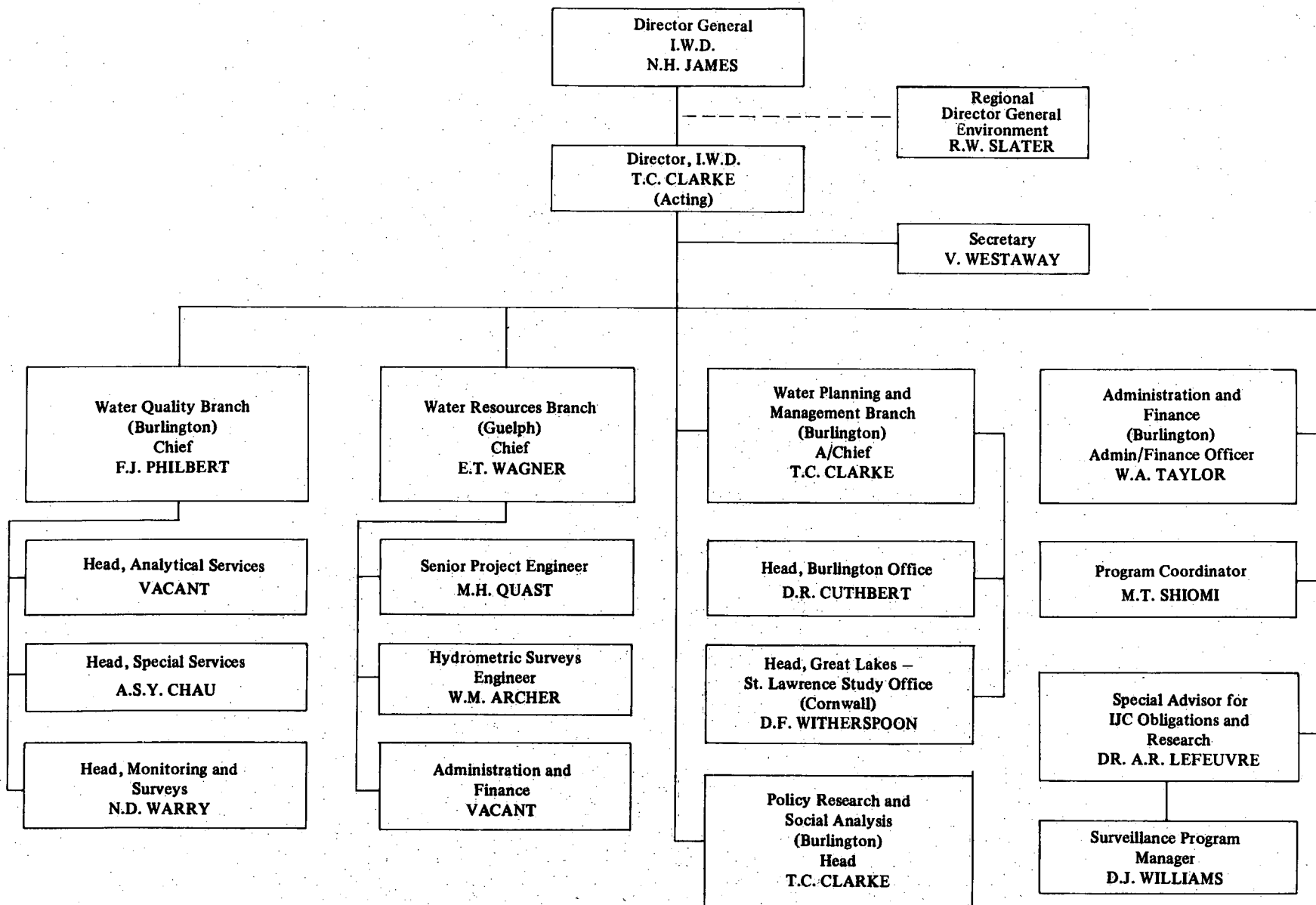
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