

WATERSHED PLAN



the metropolitan toronto and region
conservation authority



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WATERSHED PLAN

**THE METROPOLITAN TORONTO AND REGION
CONSERVATION AUTHORITY**

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DOWNSVIEW, ONTARIO
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1. INTRODUCTION

Each Conservation Authority in Ontario has been directed by the Province of Ontario to:

"study and investigate the watershed and prepare and file with its member municipalities and the Minister of Natural Resources, a Watershed Plan."

- Report of the Working Group on the Mandate and Role of the Conservation Authorities of Ontario (1979).

Watershed planning is not a new initiative in the Province of Ontario. When each conservation authority was established, a watershed inventory was compiled and a resource management program proposed. Many of these inventories became out-of-date and new technologies were developed which required consideration in establishing program priorities and implementing watershed objectives. The Authority needed to review its work in the context of new information. Community requirements, as served by the Authority, had also evolved and programs and policies needed evaluation and, where appropriate, redirection.

The Metropolitan Toronto and Region Conservation Authority recognized the need to review and evaluate its resource management policies and programs and to prepare a comprehensive management statement as early as 1974. Work on this review commenced in 1975.

As a result of carrying out studies to inventory the Authority's area of jurisdiction, reviewing existing policies and programs, and developing this Watershed Plan, it has been recognized that a continual updating of the data base used to propose resource management measures is required. Therefore, a part of the Authority's subsequent efforts will be directed to maintaining and, where required, expanding a data base upon which logical and justifiable resource management decisions may be made.

1.1 PLAN PREPARATION

The following provides a brief summary of the reviews and studies carried out during the preparation of this Plan.

1.1.1 Conservation Reports

These documents, prepared for each watershed, provided valuable historical resource information and identified conditions in the Authority's watersheds during the late 1940's and early 1950's.

1.1.2 Mapping

New metric base mapping (1:2000) was prepared for all drainage areas exceeding 1300 hectares and was compiled from aerial photography undertaken in 1976 and 1977. The mapping used prior to this was prepared during the late 1950's and early 1960's, with some updating in 1972, and did not accurately depict current land use and physical characteristics.

1.1.3 Hydrologic/Hydraulic Modelling

Following the preparation of the base mapping, hydrologic/hydraulic modelling studies were carried out to identify those areas susceptible to flooding under various frequency storm events and the Regional Storm.

1.1.4 Damage Centre Analysis

Having identified flood susceptible areas, an analysis and evaluation of the value of potential damage was undertaken to establish an economic component for use in the formulation of remedial measures.

1.1.5 Erosion Inventories

During 1977, erosion sites requiring remedial measures were identified in each of the Regional Municipalities of Durham, Peel and York. This provided information similar to that identified within Metropolitan Toronto prior to the adoption of the 1973 Project for Erosion Control and Bank Stabilization in Metropolitan Toronto.

1.1.6 Environmental Review

As many of the works being proposed by the Authority will be subject to review under The Environmental Assessment Act, background data was collected at sites of potential remedial measures for flood and erosion control and in connection with Authority waterfront development proposals. These studies and the analysis of data continue beyond the period of Plan preparation. Inventories of Authority lands designated for Conservation Areas and Forest and Wildlife Areas were also carried out in order to provide environmental data for Master Plan development.

1.1.7 Storm Water Management

The Authority's concerns for the impact of development proposals on downstream flooding and erosion control required the review of storm water management systems, and resulted in the formulation of program proposals, as part of this Plan.

1.1.8 Headwater Management

Community interest in the headwaters area, particularly the Oak Ridges Moraine and Niagara Escarpment, became evident through the Authority's 1976 Headwaters Management Seminar. Subsequently, a review and consolidation of existing information pertaining to the headwaters were undertaken to identify resource management requirements and to enable policy development.

1.1.9 Fisheries

Between 1973 and 1976, the Authority and the Ontario Ministry of Natural Resources studied the fisheries resource on Authority lands and proposed improvements to increase the potential for angling opportunities.

Studies by staff to assess the potential of streams, on both private and public land, to support a cold water fishery and stream enhancement works were initiated in 1979 under the Strategic Planning for Ontario Fisheries (SPOF) Program.

1.1.10 Inventories of Authority Managed Lands

Biophysical and forest inventories are being carried out to assist in the formulation of management proposals. Authority lands were surveyed to identify potential for forest extension to control wind erosion, to stabilize valley walls, to reduce disturbance from adjacent land uses, and to improve wildlife habitat. Biophysical inventories will identify those lands sensitive to recreational use.

1.1.11 Agriculture

Inventories of agricultural land practices on Authority land were undertaken to assist in the formulation of concept plans for Authority lands and to provide information for future lease agreements.

1.1.12 Visitor Survey

A comprehensive survey was carried out in 1979 to augment data collected for Conservation Area use in 1972 and waterfront park use in 1972 and 1976. Review and analysis of this information is required to ascertain community requirements and to enable the planning of relevant facilities.

1.1.13 Environmentally Sensitive/Significant Areas

Preliminary work in the identification of areas suitable for Authority concern included the review and consolidation of all previous studies carried out within the watershed by other groups or agencies. Subsequently, site evaluations, based on defined Authority goals and objectives, will permit the delineation of the lands suitable for Authority acquisition or regulation and recommendations of appropriate management techniques.

1.1.14 Valleyland Biophysical Inventories

These studies were initially undertaken to assist in the development of valleyland policies as part of the preparation of an Official Plan for Metropolitan Toronto. The Authority, in 1978, extended this mapping project to include the valleylands adjacent to Metropolitan Toronto so as to assist in the review of planning proposals, to identify valleyland management requirements and to evaluate proposals for relocation of the Authority's fill regulation line.

1.1.15 Municipal/Provincial Planning Documents

A review and consolidation of current municipal and provincial planning proposals were necessary to identify and assess their impact on the future direction of Authority resource management programs and policies. Continual review and evaluation of subsequent proposals will be required to enable the Authority to respond to changes within its watershed.

1.1.16 Public Participation

Throughout the preparation of the Watershed Plan the Authority has maintained an ongoing effort to involve and gain input from its watershed community. The following specific public participation steps were taken.

- (a) An Interim Water and Related Land Management Plan and an Interim Conservation and Recreation Land Management Plan were prepared and circulated to all member municipalities and local municipalities, together with ministries of the Government of Ontario, for comment. The Interim Plans reviewed the historic programs of the Authority, outlined physical characteristics and resource management problems and recommended candidate policies and programs for consideration. Responses from the majority of municipalities were received after, in many cases, the municipalities had discussed the plans in public meetings. The Interim Plans were also circulated for comment to the area school boards, The Metropolitan Toronto Board of Trade and various citizen groups on request. The comments received on the Interim Plans were considered a major input to the Watershed Plan.
- (b) The Authority established a Technical Task Force to advise on specific aspects of the Watershed Plan including the Flood Control, Erosion and Sediment Control, Storm Water Management and Conservation Land Management Programs. The Technical Task Force was made up of municipal and provincial officials from various departments and ministries having an interest in the works to be considered in these programs. The major alternative strategies were considered by the Technical Task Force and recommendations made to the Authority.
- (c) The Authority attended council and public meetings to discuss aspects of the programs considered by the Technical Task Force. Particular emphasis was placed on the damage centre concept in the Flood Control Program.
- (d) Public seminars to which technical experts, municipal representatives, citizen groups and individuals were invited, were held on the Storm Water Management, Erosion and Sediment Control and Conservation Land Management Programs, particularly as they affected the headwater zone.
- (e) Public meetings, either in the form of discussions with affected owners, public forums or citizen liaison committees, were held to discuss all waterfront area concept plans which are found in the Lake Ontario Waterfront Development Program and the proposals of the Shoreline Management Program. Several meetings were held with the boating community about the Lake Ontario Waterfront Development Program as it affects boating.

- (f) The proposals of the Watershed Recreation Program were supported by visitor surveys and wide public discussion of the proposals of the Royal Commission on Metropolitan Toronto with respect to the Authority's recreational use of conservation lands. The proposals of the Community Relations Program were developed in cooperation with a Joint Planning Committee which has been established between the Authority and the area school boards.
- (g) The proposals in the Heritage Conservation Program were developed in cooperation with the Historical Sites Advisory Board which has representatives from many facets of the historical sites community.
- (h) The Authority has had input into the preparation of municipal official plans and has commented on official plan proposals. This participation included working with the Metropolitan Toronto Planning Committee on the Metro Valley Land Study.

All of the Programs and the Watershed Plan in their draft form were submitted to all member municipalities of the Authority, all local municipalities and the Ministry of Natural Resources for comment and endorsement. A team of Authority representatives presented the Plan to the councils of all member municipalities, the majority of all local municipalities and the Cabinet Committee on Resource Development. As an aid in these presentations the Authority prepared exhibits of the Plan which were placed in the public areas of municipal buildings and shopping plazas together with a tabloid summary of the Plan. As a result of these presentations, comments have been received and the Watershed Plan and the Program documents have been revised, where required, to accommodate the concerns expressed.

As a result of these public participation steps, the Watershed Plan is an expression by the community of the preferred strategies for the management of renewable natural resources in the area under the Authority's jurisdiction.

2. BACKGROUND AND HISTORY

In 1946, the Province of Ontario enacted The Conservation Authorities Act, permitting municipalities in a watershed (or watersheds) to form a conservation authority to conserve and manage natural resources. The basic concepts embodied in the Act are:

- . local initiative
- . cost sharing (municipal/provincial)
- . watershed jurisdiction.

The Metropolitan Toronto and Region Conservation Authority was formed in 1957 by amalgamation of four earlier authorities: the Etobicoke (1946), later including Mimico Creek; the Humber (1948); the Don (1948); and the Rouge-Duffin-Highland-Petticoat (1954). This union permitted a broader perspective to resource management and a more substantial financial base.

The primary responsibilities of the Authority are for water management in the Metropolitan Toronto region, specifically in response to the flood damages incurred by Hurricane Hazel in 1954. The programs of the Authority are developed in response to community requirements for resource management for flood control, erosion control, regional recreation and conservation education. In 1970, these responsibilities were broadened by its designation as implementing agency for The Metropolitan Toronto and Region Waterfront Plan.

2.1 JURISDICTION AND PARTICIPATING MUNICIPALITIES

The Authority's area of jurisdiction includes 3,467 square kilometres: 2,506 on land and 961 water-based. This comprises all watersheds of all streams entering Lake Ontario from Etobicoke Creek to Carruthers Creek (added in 1959), as well as Lake Ontario to a point defined by the Territorial Divisions Act, R.S.O. 1970, Chapter 4.5.8 and Order-in-Council 49/74.

The Authority has six participating municipalities: The Municipality of Metropolitan Toronto; The Regional Municipalities of Durham, Peel and York; and the Townships of Adjala and Mono. In 1979 the population within the Authority's jurisdiction was approximately 2,500,000.

2.2 ORGANIZATION

The Authority's member municipalities and the Province of Ontario appoint members to the Authority in accordance with The Conservation Authorities Act, Sections 5 and 13. Of the 51 appointed members, the following is the current distribution of membership:

Province of Ontario	3	
Metropolitan Toronto	24	
Region of Durham	5)
)
Region of Peel	8)
) = 24
Region of York	10)
)
Adjala-Mono	1)

Section 5 of the Act requires that the number of representatives from Metropolitan Toronto be equal to the total number of appointees by other participating municipalities.

The Authority is a body corporate whose administration of policy is determined by its mandate under the Act and by Regulations and Rules which it has adopted. To carry out its responsibilities the Authority appoints nine Advisory Boards: four watershed boards, representing the previously named authorities; and five functional boards, representing specific programs. The Boards are:

- . Conservation Land Management
- . Flood Control and Water Conservation
- . Historical Sites
- . Information and Education
- . Waterfront
- . Don Valley
- . Etobicoke-Mimico
- . Humber Valley
- . Rouge-Duffin-Highland-Petticoat.

The Advisory Boards consider matters defined by their terms of reference and make recommendations to the Executive Committee and to the Authority. The regular business of the Authority is conducted by the Executive Committee comprised of the Chairman and Vice-Chairman of the Authority; the Chairmen of the nine Advisory Boards; and the Chairman of The Metropolitan Toronto and Region Conservation Foundation (if also an appointee to the Authority).

The Chairman of the Authority may be appointed by the Province of Ontario or elected from among the members of the Authority. The Vice-Chairman is elected annually, by the appointed members, from the total membership.

The Metropolitan Toronto and Region Conservation Foundation was formed in 1961 "to create and operate a fund to be used exclusively for the benefit of The Metropolitan Toronto and Region Conservation Authority in the cultivation and advancement of conservation." The Chairman of the Foundation is elected annually.

2.3 FUNDING

Provision is made in The Conservation Authorities Act for the Province of Ontario to make grants to the Authority and for the Authority to levy its

participating municipalities to enable the implementation of Authority projects. Grants for Black Creek Pioneer Village are not available under The Conservation Authorities Act but are available from the Ministry of Culture and Recreation under its museum grant program.

The Federal Government has also participated in funding major remedial flood control and water conservation works and in waterfront development.

Funds are also raised through user fees at Authority operated facilities; through rental of Authority-owned property; from charges made for Authority services; and through other government agencies, such as Boards of Education and Wintario.

The Metropolitan Toronto and Region Conservation Foundation receives donations from individuals, organizations, foundations and corporations which are used to augment the Authority's funding for specific projects, such as Pioneer Village.

2.4 PROGRAM IMPLEMENTATION

The Authority's resource management program is based on:

- . its mandate as established by The Conservation Authorities Act, and
- . its role as determined by consultation with the Province and the participating municipalities.

The Province and the participating municipalities, in reviewing program proposals, determine the appropriate public participation. The public also may attend all meetings of the Authority, its Executive Committee and Advisory Boards, and may submit briefs regarding proposals.

2.5 MANDATE AND ROLE

The work of conservation authorities derives from The Conservation Authorities Act which, in its provision, defines the scope and limits of Authority responsibilities. These legislative provisions provide the basis for Authority work. They are sufficiently broad to enable authorities to deal with the conservation needs which arise from the characteristics of individual watersheds and the pattern of development which has been imposed on them.

"Objects 19. The objects of an authority are to establish and undertake, in the area over which it has jurisdiction, a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals.

R.S.O., 1970, c. 78, s. 19.

*Powers of 20. For the purpose of accomplishing its objects, an author-
ities. authority has power,*

(a) to study and investigate the watershed and to determine a program whereby the natural

resources of the watershed may be conserved, restored, developed and managed;

- (b) for any purpose necessary to any project under consideration or undertaken by the authority, to enter into and upon any land and survey and take levels of it and make such borings or sink such trial pits as the authority considers necessary;
- (c) to acquire by purchase, lease or otherwise and to expropriate any land that it may require, and subject to the approval of the Lieutenant Governor in Council, to sell, lease or otherwise dispose of land so acquired;
- (d) to lease for a term of one year or less, without the approval of the Lieutenant Governor in Council, land acquired by the Authority;
.....
- (f) to purchase or acquire any personal property that it may require and sell or otherwise deal therewith;
- (g) to enter into such agreements for the purchase of materials, employment of labour and such other purposes as may be necessary for the due carrying out of any project;
- (h) to enter into agreements with owners of private lands to facilitate the due carrying out of any project;
- (i) to determine the proportion of the total benefit afforded to all the participating municipalities that is afforded to each of them;
- (j) to erect works and structures and create reservoirs by the construction of dams or otherwise;
- (k) to control the flow of surface waters in order to prevent floods or pollution or to reduce the adverse effects thereof;
- (l) to alter the course of any river, canal, brook, stream or watercourse, and divert or alter, as well temporarily as permanently, the course of any river, stream, road, street or way, or raise or sink its level in order to carry it over or under, on the level of or by the side of any work built or to be built by the authority, and to divert or alter the position of any waterpipe, gas-pipe, sewer, drain or any telegraph, telephone or electric wire or pole;
- (m) to use lands that are owned or controlled by the authority for such purposes, not inconsistent with its objects, as it considers proper
- (n) to use lands owned or controlled by the authority for park or other recreational purposes, and to erect, or permit to be erected, buildings, booths and facilities for such purposes and to make charges for admission thereto and the use thereof;
- (o) to collaborate and enter into agreements with ministries and agencies of government, municipal councils and local boards and other organizations;

(p) to plant and produce trees on Crown lands, with the consent of the Minister, and on other lands with the consent of the owner, for any purpose;

(q) to cause research to be done;

(r) generally to do all such acts as are necessary for the due carrying out of any project.

R.S.O. 1970, c. 78, s. 20; 1971, c. 64, s. 4;
1972, c. 1, s. 2; 1972, c. 4, s. 12."

Under the provisions of Sections 27, 28, and 29 of The Conservation Authorities Act, the Authority is empowered to enact regulations relating to the carrying out of its work.

- i) Section 27: Establishes the basis for the enactment of regulations pertaining to Fill, Construction and Alteration to Waterways. This section defines the instances wherein Authority permission may be required for works; the exceptions to such regulations; and the procedures for hearings and appeals under the regulation.

The Metropolitan Toronto and Region Conservation Authority has adopted and registered Schedules to Ontario Regulation 735/73 under this section of The Conservation Authorities Act. As a result of the mapping and studies completed in preparing this Plan, revisions to the regulation will be proposed for adoption.

- ii) Section 28: Establishes the ability of an authority to "make regulations applicable to lands owned by the Authority." These regulations pertain to public use of Authority lands and the conditions, terms, fees, and permits which may apply.

The Metropolitan Toronto and Region Conservation Authority has adopted Ontario Regulation 845/77 to implement the provisions of this section of The Conservation Authorities Act. Amendments to this regulation may be made, as required, relating to the fee structure for public use of Authority lands and facilities.

- iii) Section 29: Establishes the Authority's ability to make regulations with respect to calling of and procedures at meetings; powers and duties of the Secretary-Treasurer; designation of signing officers; and the delegation of powers to the Executive Committee. Regulations have been adopted by the Authority to so guide its work.

The 1979 Report of the Working Group on the Mandate and Role of the Conservation Authorities of Ontario reviewed the programs of authorities in order to clarify their role in watershed management. It affirmed the basic principles of local involvement, municipal-provincial partnership and watershed jurisdiction, as established in legislation and practice, and stated that:

"The mandate and powers provided by The Conservation Authorities Act shall be retained and consideration given to revisions to the legislation which will assist Conservation Authorities in meeting their responsibilities for the conservation, restoration, development and management of natural resources."

This report has been circulated to all conservation authorities, municipalities, and interested groups and agencies for comment. These responses are being considered and will form part of recommendations to the Provincial Cabinet.

2.6 AUTHORITY PROGRAMS 1957-1981

To implement its program objectives for resource management, the Authority, since its inception, has adopted policies and projects. The following summarizes the major program areas undertaken since 1957 and Figure 1 illustrates completed works.

2.6.1 Water and Related Land Management

This primary responsibility of the Authority has been dealt with through a number of projects and policy statements including:

- . the Plan for Flood Control and Water Conservation (1959) proposing a combination of remedial and preventative measures to address the problem of flood control;
- . the Statement of Flood Plain and Conservation Lands Policy (1961) formalized Authority policy regarding flood plain acquisition, regulation, and valleyland management;
- . the Master Plan for Flood Plain and Conservation Lands (1962, extended in 1974) formed the framework for the land acquisition component of flood control and water conservation and included lands below crest of slope along the major valleys;
- . Erosion Control and Bank Stabilization in Metropolitan Toronto (1973) and adding The Regional Municipalities of Durham, Peel and York (1979) enabled the provision of remedial works to address the problem of slope instability and erosion.

2.6.2 Conservation and Recreation Land Management

As part of its agreements with the Federal and Provincial governments for flood control and water conservation, the Authority has adopted policies and programs to deal with those lands which it acquires and, subsequently, to assist other landowners to achieve conservation land management objectives. This work includes:

- . the Plan of Ancillary Conservation Measures (1961) prepared, as required by the Federal and Provincial governments, to address Authority management of lands acquired for flood control and water conservation and

to provide recreational use, fish and wildlife management, reforestation and stream improvements;

- . Pollution Control and Recreation in the Metropolitan Toronto Region (1963) recommended to other jurisdictions policies aimed at maintaining high water quality standards in order to retain the ability of watercourses to provide recreational benefits;
- . the Private Reforestation Assistance Program (1957) enabling the Authority to provide, through reforestation, for rehabilitation of erosion-susceptible headwaters lands in private ownership;
- . the Forestry Agreement (1960) permitting the long-term management of reforested Authority lands by the Ministry of Natural Resources;
- . the Streambank Erosion Control Program (1966) enabling the Authority to carry out remedial works upstream of proposed reservoirs on both Authority owned and private lands;
- . the development and management of Conservation Areas and Forest and Wildlife Areas to enable public access and use.

2.6.3 Metropolitan Toronto and Region Waterfront

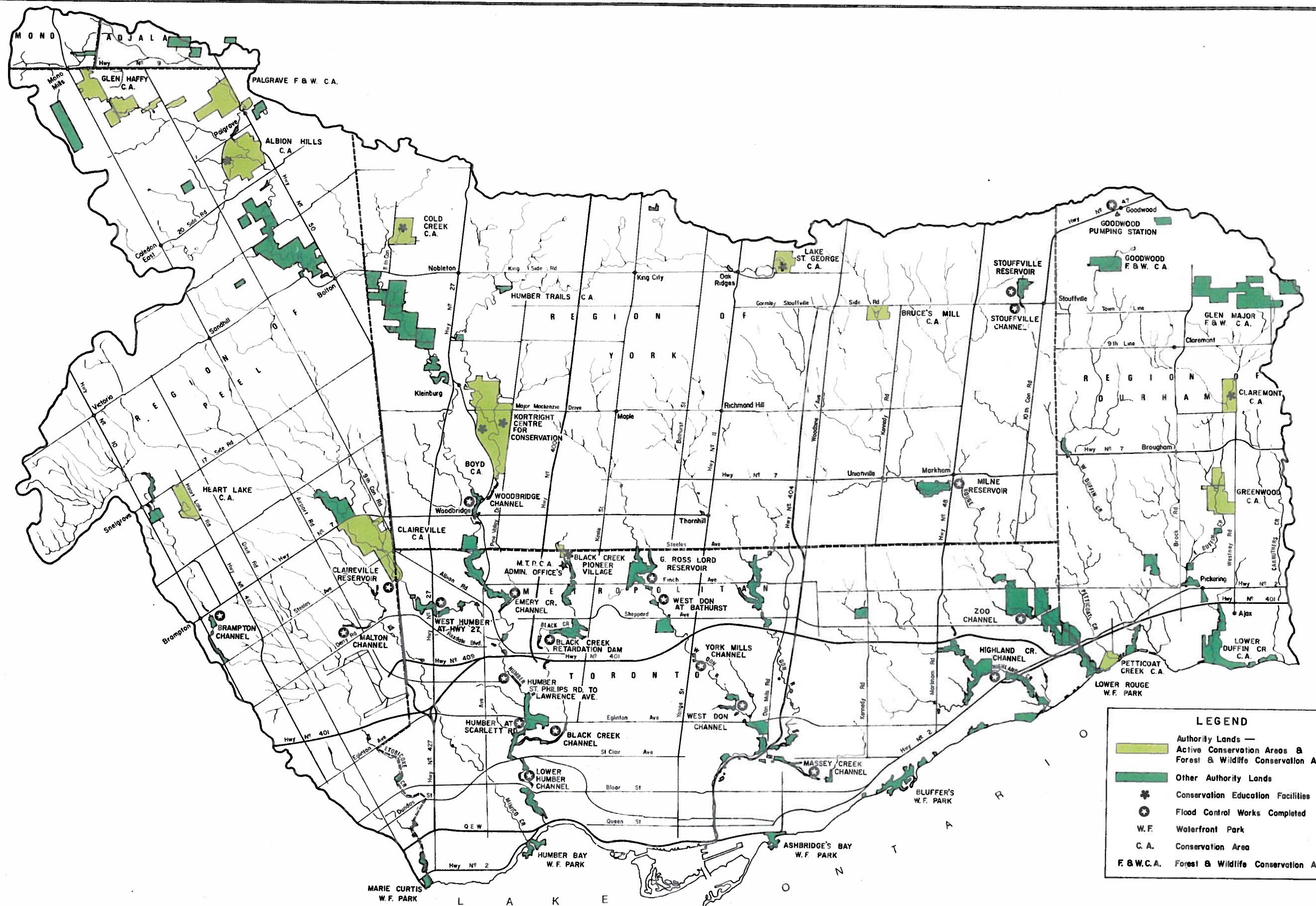
In 1970, the Authority was designated by the Province of Ontario to implement that part of the 1967 Waterfront Plan, prepared by the former Metropolitan Toronto Planning Board, falling within Authority jurisdiction. The Plan was aimed at providing water-oriented recreational opportunities and shoreline management along Lake Ontario. Three policy and program documents were adopted to implement this work.

- . The Metropolitan Toronto and Region Waterfront Plan 1972-1976 (1972), a 5 year work project;
- . The Metropolitan Toronto and Region Waterfront Plan 1972-1982 (1974), a statement of policies and objectives for a 10 year period;
- . The Metropolitan Toronto and Region Waterfront Project 1977-1981 (1976), a 5 year work project.

2.6.4 Heritage Conservation

The Authority's heritage conservation work was initiated by the Humber Valley Authority's acquisition of the Dalziel property as part of the flood plain lands of the Black Creek. Over the years, additional structures were identified and have been relocated to Black Creek Pioneer Village, restored and utilized to recreate life in a pre-Confederation settlement. The policies for development and management at this location have been set out in two reports:

- . Pioneer Village - Black Creek Conservation Area (1964), and
- . Black Creek Pioneer Village (1969).



In addition, the Authority has conserved or cooperated in the conservation of other structures of historical value, in situ, including Albion House (Albion Hills Conservation Area), the Bruce Mill and the Bruce House (Bruce's Mill Conservation Area) and Todmorden Mills (Borough of East York). Archeological sites have also been identified on Authority lands at Black Creek and at Boyd Conservation Area.

2.6.5 Information and Education

The Authority's resource management programs have been complemented through the evolution of programs to inform and involve the watershed community. These programs are:

- . Community and Staff Relations and
- . Outdoor and Conservation Education.

To accomplish the objectives of these programs, policy statements have been adopted to guide and direct operations. In particular, policies related to the planning, development and management of Authority lands and facilities for educational purposes were adopted in 1975.

2.7 OTHER RESOURCE-RELATED JURISDICTIONS

The Authority is not the only agency in the Metropolitan Toronto region with resource management responsibilities. Municipal, provincial and federal programs also deal with resource management issues. The following provides a brief summary of the responsibilities of various levels of government.

JURISDICTION

RESOURCE/RELATED RESPONSIBILITY

A. Municipal

Preparation of Official Plan, secondary plans, subdivisions as under The Planning Act. Policy statements regarding resource-related municipal interests. Exercise of development control. Responsibilities for drainage, municipal services, open space.

B. Provincial Ministries

1) Agriculture & Food

General: Agricultural drainage and erosion control. Administers The Drainage Act and The Tile Drainage Act, among others, to provide drainage and tile drainage works and to establish grants for assistance.
Specific: Extension services, on request, provide, through agricultural representatives, a means of increasing the farmer's technical knowledge regarding prevention of soil loss. Carries out research regarding soils and crop production.

- ii) Culture &
Recreation
- General: Historic sites, heritage conservation.
- Specific: Develops policies and programs for the conservation, protection and preservation of historical resources and heritage under The Ontario Heritage Act. Supports Ontario Heritage Foundation. Provides grants and administers Wintario program. Provides funding assistance to Black Creek Pioneer Village and the Kortright Centre for Conservation.
- iii) Education/
Colleges &
Universities
- General: Outdoor Education.
- Specific: Develops curriculum regarding outdoor and conservation education and other resource-related subjects. Through The Schools Administration Act, Boards are enabled to participate in programs provided by, or in cooperation with, conservation authorities. Teacher training programs, also in cooperation.
- iv) Environment
- General: Water quality, water supply, storm water management, ground water management, environmental assessment.
- Specific: Administers The Ontario Water Resources Act, The Environmental Protection Act and The Environmental Assessment Act (among others). Develops guidelines for waste disposal; ensures environmental safeguards in planning proposals; administers water-taking permit system; establishes guidelines and reviews environmental assessments.
- v) Housing
- General: Land use planning.
- Specific: Formulates land use planning and development policies; reviews and approves municipal planning proposals under The Planning Act. Ensures the inclusion of policies which recognize and support Provincial interests.
- vi) Intergovernmental
Affairs
- General: Municipal policy.
- Specific: Administers The Municipal Act and the legislation relating to the establishment and organization of Metropolitan Toronto and the Province's Regional Municipalities. Recommends and advises regarding municipal and interprovincial policy.

vii) Natural Resources

General: Fish and wildlife, forest management, outdoor recreation and mineral resources.

Specific: Manages agreement forest land for multiple use purposes, including the production of timber. Grants are available to private landowners under The Woodlands Improvement Act to assist in forest management. Manages Crown Land. Provides water and related land management services to conservation authorities.

Administers The Lakes and Rivers Improvement Act, requiring permits for certain works. Enhances streams for fish habitat and provides a wildlife land management program. Administers a licencing program under The Pits and Quarries Control Act.

viii) Provincial
Secretariat
-Resources
Development

General: Relating policies and priorities of all resource-oriented Provincial ministries; administers The Niagara Escarpment Planning and Development Act. Responsible for coordination amongst the Ministries of Agriculture and Food, Energy, Environment, Housing, Industry and Tourism, Labour, Natural Resources, Northern Affairs, and Transportation and Communications. Niagara Escarpment reports to Secretariat regarding preparation and implementation of development plan.

ix) Treasury and
Economics

General: Financial policy; administers The Parkway Belt Planning and Development Act.
Specific: The Parkway Belt System, part of the Toronto-Centred Region Concept, is designed to provide urban separation; utility corridors; and open space through land use controls.

C. Federal

Conservation authorities have limited direct contact with federal resource-related legislations with the exception of certain Acts pertaining to bodies of water such as Lake Ontario and the Flood-Damage Reduction Program.

Part of the Authority's work in preparing its Watershed Plan involved discussions with the numerous other resource-related groups in order to define the role of the Authority within its area of jurisdiction.

3. RESOURCE INVENTORY

In order to formulate resource management policies and programs, the Authority carried out a comprehensive resource inventory. The following information is provided as a summary.

3.1 LOCATION

The Authority's watershed jurisdiction centres around Metropolitan Toronto, on the north and toward the western end of Lake Ontario, and includes nine major watercourses - the Etobicoke, Mimico, Highland, Petticoat, Duffin and Carruthers Creeks and the Humber, Don and Rouge Rivers. In addition, numerous short watercourses flow into Lake Ontario particularly in Scarborough and around Frenchman's Bay, Pickering.

The Authority's area of jurisdiction covers 3,467 square kilometers, of which 2,506 are land, and is bounded on the south by the international border in Lake Ontario. Approximately 64 kilometers of Lake Ontario shoreline are included.

3.2 PHYSIOGRAPHIC FEATURES

The physiographic characteristics of the region are factors important to the development of resource management programs by the Authority. The following provides a general description of the features identified on Figure 2.

3.2.1 The Oak Ridges Moraine Complex

Stretching across the northern boundary of the Authority's watershed, this regionally significant landform is the divide for streams draining to Lake Ontario and those draining to the north. The Moraine is referred to as interlobate, having been formed between two ice lobes during the last glacial period, and exemplifies the characteristics typical of such features - knobby hills, kettle lakes, and a complex mix of glacially deposited sand, gravel and till with outcrops of boulder clay.

On the Moraine itself, few streams are found, however, precipitation falling over the height of land percolates through the porous materials until impervious material is reached, then flows horizontally and surfaces as streams along the slopes of the Moraine.

3.2.2 Niagara Escarpment

The Niagara Escarpment, in the northwest section of the Authority's jurisdiction, is the headwaters of the Main Branch of the Humber River. This landform was created over 400 million years ago and is composed of layers of shale, limestone, sandstone and dolomite. Subsequent erosion and the deposition of a mantle of glacial drift have given the Escarpment its present characteristics.

3.2.3 Till Plain

The Till Plain, within the Authority's jurisdiction, is a glacial feature exhibiting the characteristics of a ground moraine - from relatively little relief to areas of irregular knolls and hollows. In the eastern parts of the watershed the till materials are sandy while toward the west clay predominates. Tributaries of the Etobicoke, Humber, Don, Rouge, Petticoat and Duffin traverse the Plain cutting sharp valleys where the flow is at right angles to the slope.

3.2.4 Peel Plain (Bevelled Till)

Through the western and central portions of the region stretches an undulating clay plain, underlain by till or boulder clay. The heavy textured clays and isolated sandy areas may have been deposited by a temporary glacial lake.

The Brampton Esker, a narrow gravel ridge, cuts across the Plain in the Region of Peel and is a source area for the Etobicoke Creek. Tributaries and main branches of the Etobicoke, Mimico, Humber, Don, Rouge and Duffin cut valleys of varying depths in the Peel Plain.

3.2.5 Iroquois Plain and Shoreline

During glaciation, the lowlands of Lake Ontario were inundated by the waters of glacial Lake Iroquois covering previous clay and till deposits and adding, in some locations, a layer of sand. The shoreline of this glacial lake is evident across the central and eastern part of the region and, at the Scarborough Bluffs, becomes nearly coincident with the present shoreline of Lake Ontario.

The river mouths and bays of the nine rivers and creeks of the watershed are found on this plain. Post-glacial erosion and deposition have modified the valley features while the land between the valleys is characterized by clays and till.

3.2.6 Lake Ontario Shoreline

The Lake Ontario shoreline within Authority jurisdiction extends from the Etobicoke-Credit River divide in the west to the Carruthers Creek-Lynde Creek divide in the east.

The shore cliff to the west is comparatively uniform with sandy sloping beaches to 7 metre sand, silt and clay bluffs. Fine sand beaches occur in the Toronto sector changing to 100 metre bluffs along the Scarborough lakefront. In Pickering and Ajax, the shoreline is characterized by bluffs of 6 to 23 metres, interspersed with flat sand beach areas.

3.3 WATERCOURSE CHARACTERISTICS

A full description of each of the Authority's nine major watercourses is contained in the Flood Control Program. Table 1 provides, in chart form, the significant characteristics of each watercourse. In general, the watercourses are relatively short and react quickly to rainfall events. In specific instances, the flashy nature of the watercourses has been aggravated by the conversion of land from rural to urban use.

3.4 CLIMATE

The Authority's jurisdiction exhibits a modified continental climate of moderately cold winters and moderately hot summers. Precipitation is evenly distributed throughout the year with snow and rain from cyclonic storms predominating in winter and convectional precipitation, particularly thunderstorms, during summer. Considerable periods of sunshine occur especially during the summer.

The mean daily temperatures, maximum and minimum, for the region are: January (-2 degrees C, - 11 degrees C), April (11 degrees C, 0 degrees C), July (27 degrees C, 14 degrees C) and October (14 degrees C, 4 degrees C). Lake Ontario exerts a moderating influence on climate which decreases with distance.

3.5 FOREST RESOURCES AND VEGETATION

The Authority's area lies within the Great Lakes - St. Lawrence Forest Region in which the predominating natural cover is maple-beech woodlot. Coniferous stands, hemlock, white pine and white cedar are often found in conjunction with river valleys. Settlement of the region cleared much of the original forest, however, more recently the reforestation work of the Authority and the Ministry of Natural Resources has seen the reestablishment of forest cover, particularly in the headwaters.

A high diversity of herbaceous and shrub species are found throughout the watershed and these, along with the forested lands, provide habitat for fish and wildlife and influence rates of runoff and erosion.

3.6 FISH AND WILDLIFE

The presence of fish and wildlife resources are dependent upon the existence of suitable habitat. As land has been converted from forest to agriculture and to urban uses, the quality and quantity of habitat has decreased significantly, reducing fish and wildlife populations and, in some cases, eliminating certain species.

Within the watershed, there remains a diversity of fish and wildlife resources which both the Authority and the Ministry of Natural Resources are working toward maintaining through habitat improvement. In particular, recent efforts have been directed to studying the fisheries of the region and to stream improvements which will increase the cold water fishery.

3.7 PATTERNS OF DEVELOPMENT

Within the Metropolitan Toronto region, urbanization had its beginnings in the eighteenth century. From the tiny settlements of that time has grown a substantial urban community of over two million people.

<u>WATERCOURSE</u>	<u>DRAINAGE AREA</u>	<u>SOURCE AREA</u>	<u>CONFLUENCE</u>	<u>GRADIENT</u>	<u>PHYSIOGRAPHIC INFLUENCE</u>	<u>ADJACENT LAND USE</u>
Etobicoke	207 km ²	East Branch-Heart Lake West Branch-Till Plain Little Etobicoke-Till Plain	East & West-north of Bloor Street Little Etobicoke-at the Queensway	Main & West-3.0m/km East-4.5m/km Little Etobicoke-11.4m/km	Till Plain and Peel Plain predominate. Iroquois Plain in lower reaches	Upper reaches rural; central and lower reaches urban
Mimico	28 km ²	Rises on Peel Plain	East & West-at Derry Road	4.9m/km	Peel Plain in north; Till Plain in central sectors; Iroquois Plain downstream	Predominately urban with development occurring in upper reaches
Humber	657 km ²	West-Till Plain Main-Niagara Escarpment & Moraine East-Wilcox Lake Black Creek-Peel Plain	Main & East-at Woodbridge Main & West-at Thistletown Main & Black Creek-west of Scarlett Road	West-4.6m/km East-4m/km Main-above Cedar Mill 10m/km -below Cedar Mill 2.5m/km	West-Till Plain and Peel Plain Main-Niagara Escarp. Moraine, Till Plain, Peel Plain and Iroquois Plain East-Till Plain and Peel Plain Black Creek-Peel Plain and Iroquois Plain	Predominately rural upstream of Metropolitan Toronto. Heavily urban in Metro
Don	360 km ²	West-northwest of Maple East (Little Don)-Richmond Hill area German Mills Creek-west of Richmond Hill Massey Creek-edge of Peel Plain	German Mills Creek and East Branch-at Steeles Avenue West, East and Massey Creek-near Don Mills Road and Don Valley Parkway	6m/km	Upper-Till Plain and Peel Plain Lower-Iroquois Plain	Heavily urbanized with some rural remnants in upper sections (except Massey Creek)
Highland	107 km ²	Rises in north Scarborough-vicinity of Milliken-Till Plain	Morningside Park	Upper reaches-7.8m/km Lower reaches-3m/km	Predominately Till Plain. Iroquois Plain in Lower reaches	Urban (Scarborough)
Rouge	327 km ²	Along southern edge of Moraine	Main confluence-north of Highway 401	Upper reaches-25m/km Lower reaches-2.5m/km	Southern edge of Moraine; then south across Peel Plain, Till Plain and Iroquois Plain	Predominately rural; urban in lower reaches
Petticoat	26 km ²	Rises on Till Plain	Near Finch Avenue	10m/km	Till Plain and Iroquois Plain predominate Iroquois Plain in lower section	Rural in upper reaches; urban in downstream section
Duffin	294 km ²	West-northeast of Stouffville East-northeast of Glen Major	Highway 2 and Brock Road	West-10m/km East-4 to 8m/km South of Confluence -1m/km	Southern edge of Moraine in north; then south across the Peel Plain, Till Plain and Iroquois Plain	Predominately rural; urban south of confluence
Carruther's	40 km ²	Till Plain and Iroquois Plain		Upper reaches-10m/km South of Audley-3m/km	Iroquois Plain predominates	Predominately rural; developing in lower reaches



The major watercourses within the Authority's jurisdiction have affected and been affected by this development. The valley systems have been perceived as barriers to development to be overcome; as easily accessible transportation routes; as a locale for industry requiring water or water power; as a location for residential use; as utility corridors; as storm drainage systems; as open space; and as a valuable natural resource requiring protection.

While certain of these uses are no longer relevant considerations, many still require accommodation within the valley system hence, a multi-use approach to valleyland management has evolved.

Similar changes in perception have shaped the development of the Lake Ontario waterfront within the Authority's jurisdiction. As discussed more fully in the Lake Ontario Waterfront Development Program, the waterfront initially represented the major attraction for early settlement, providing a means of transportation among communities, a source of water for industry and residential use, an access point into the hinterland by way of the valley systems, and an attractive site for community development and for recreation.

The Toronto Harbour Commissioners' Plan of 1912 was the first major effort to reserve waterfront lands for public use. Prior to that time the lakefront had increasingly been isolated from the community by the development of roads, rail systems and industry, built more and more on land created by fill. While the 1912 Plan retained the Toronto Islands and the Western and Eastern Beaches in the City of Toronto, it did not attempt to control development east or west of these areas. It was not until 1967 that a comprehensive plan for the provision of public waterfront parkland was developed to include all of the shoreline under Authority jurisdiction.

As with the valley systems, the public objectives for waterfront lands now recognize and attempt to achieve a multi-use perspective in planning.

In less than 200 years, the isolated settlements along Lake Ontario have grown, both in density and in spacial extent, to become part of the largest urban area in Ontario and, in fact, in Canada. Growth is not, however, complete and continues to add large blocks of land to urban use yearly. Figure 3 identifies existing land use within the Authority's watershed and, on the basis of current planning information, projects future land use to approximately 2000 A.D.

Certain trends appear evident in future projections within the Authority's jurisdiction:

- . urbanization will continue but, generally, at a slower pace than in the past 20 year period;
- . urbanization will most affect The Regional Municipalities of Peel, York and Durham;
- . population growth within Metropolitan Toronto will level off, if not decrease;

- . in the short term, Peel will grow most rapidly, followed by York, then Durham;
- . in the long term, the effect of the Province's objective of stimulating growth east of Metropolitan Toronto may result in increased growth in Durham, particularly in conjunction with the proposed Seaton Community.

These factors will undoubtedly affect the programs proposed by the Authority and review and reevaluation will be required on a regular basis.

3.8 PUBLIC OPEN SPACE AND RECREATION

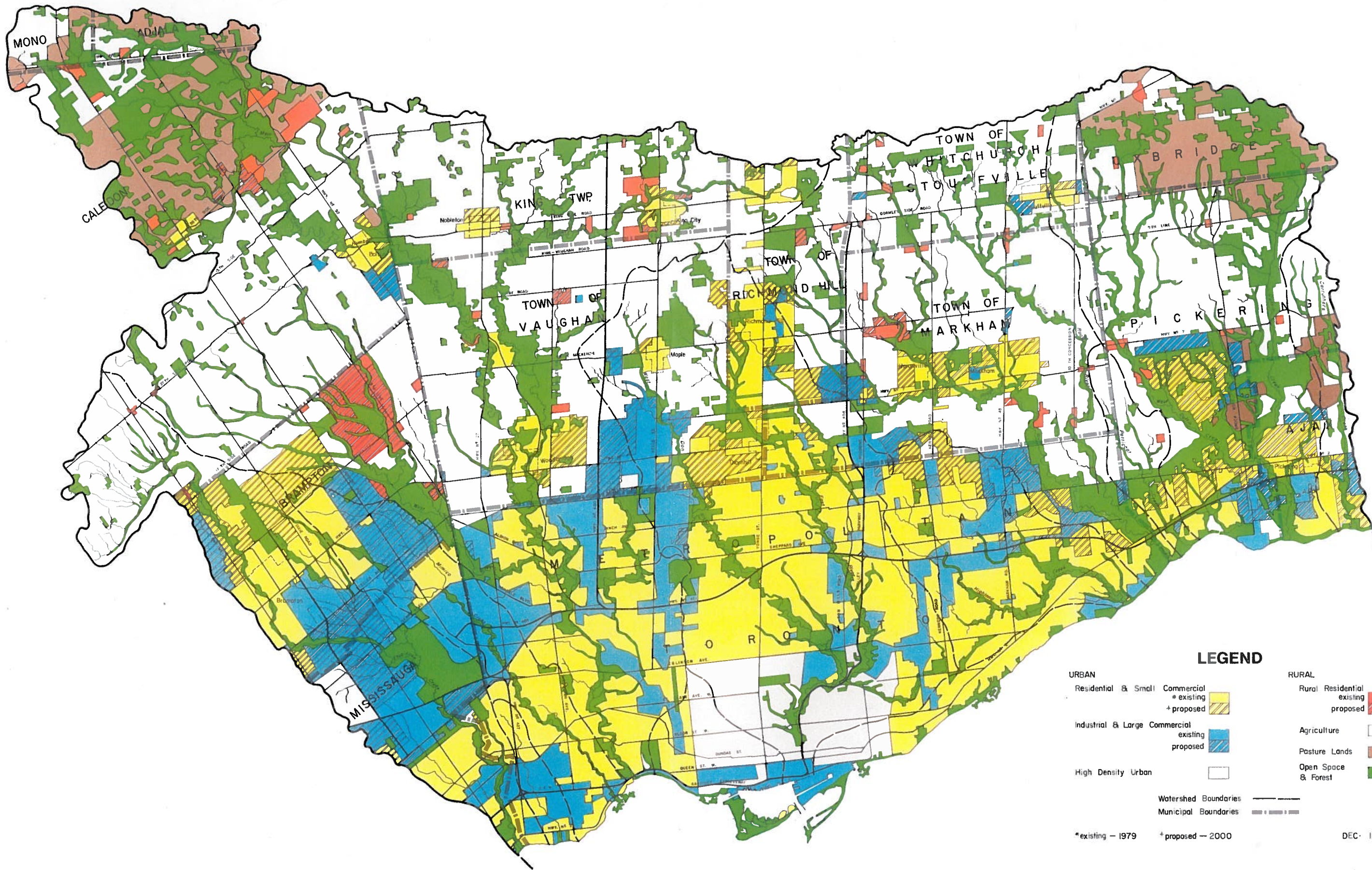
The resource management and conservation lands of specific concern to the Authority have been identified as the river valleys, the Lake Ontario waterfront, the Oak Ridges Moraine and the Niagara Escarpment. These lands are also of considerable value to the region's residents, in that they provide a land base for recreation. The Authority has recognized the unique importance of these lands in an urban and near-urban setting and has made provision for public open space uses on its lands.

The 1971 Canada Land Inventory included an assessment of land capability to attract and sustain recreation use. This inventory recognized four landscapes, within the Authority's area of jurisdiction, as having the highest potential for recreation use - the river valleys, the Lake Ontario waterfront, the Oak Ridges Moraine and the Niagara Escarpment.

The provision of public open space within the Authority's watershed varies with municipal jurisdiction. Within Metropolitan Toronto, each constituent municipality has its own parks and recreation department in addition to the overall Metropolitan Toronto Parks Department. Local municipalities provide local park facilities whereas the Metropolitan Toronto Parks Department provides "regional" open space opportunities. The Authority has contributed at both the local and Metropolitan level through the leasing of its lands for municipal use.

Outside Metropolitan Toronto, The Regional Municipalities of Peel, York and Durham do not operate regional parks departments and public open space is a responsibility of the local municipality. The Authority has contributed to "regional" opportunities outside Metro on the conservation lands acquired for water and related land management and has, where appropriate, entered into lease arrangements with local municipalities.

Within the Authority's area of jurisdiction, no Provincial Park facilities have been developed. The resource-based opportunities available on Authority lands provide a type of recreational use similar to that found in Provincial Parks and Provincial participation through funding of Authority projects has been provided.



LEGEND

URBAN	RURAL
Residential & Small Commercial • existing + proposed	Rural Residential existing proposed
Industrial & Large Commercial existing proposed	Agriculture
High Density Urban	Pasture Lands
	Open Space & Forest
Watershed Boundaries ————— Municipal Boundaries - - - - -	
* existing — 1979 + proposed — 2000	

DEC. 1979

4. DEMANDS ON THE RESOURCE BASE

In preparing the program components of this Watershed Plan, the Authority has attempted to identify the demands which will be placed on the resource base in the future and, further, to define where the Authority has the mandate or responsibility to provide for such demands. As part of each program the Authority has detailed the relevant resource management issues and has proposed a program to address these issues.

The following summarizes the major resource management demands which have been dealt with by the programs:

- . the need to provide a natural valley system capable of passing flood flows and providing flood storage;
- . the need to protect community developments which in the past were located on flood-susceptible lands;
- . the requirement to acquire, in certain instances, land which exhibits physical hazard or environmental significance/sensitivity in order to prevent inappropriate use;
- . the need to assist municipalities by providing technical input into the review of development proposals in order to prevent or reduce the impact of land use changes both on-site and in other parts of the watershed;
- . the need to provide conservation land management on private and public lands through the preparation of Conservation Plans and the availability of conservation assistance and on Authority lands through the development and implementation of management plans;
- . the requirement to make available for public recreation use those resource management lands acquired by the Authority on which such use is compatible;
- . the need to provide regional, water-oriented, open space and recreation opportunities for the public along the Lake Ontario waterfront;
- . the need to conserve and manage heritage resources on Authority lands and to make these resources available to the public;
- . the need to develop and implement an effective community relations program to inform the watershed community of the goals, policies and programs of the Authority.

5. THE WATERSHED PLAN

5.1 Introduction

The ten programs which comprise the Watershed Plan have been structured as groups of resource management activities which serve a common goal but which can be implemented as identifiable management units. In combination, the programs fulfill the Authority's overall legislative mandate, as set out in The Conservation Authorities Act:

"TO ESTABLISH AND UNDERTAKE, IN THE AREA OVER WHICH IT HAS JURISDICTION, A PROGRAM DESIGNED TO FURTHER THE CONSERVATION, RESTORATION, DEVELOPMENT AND MANAGEMENT OF NATURAL RESOURCES OTHER THAN GAS, OIL, COAL AND MINERALS."

No single program by itself is "whole". Each is complementary to the others. Nor is the Plan itself "whole". It must be considered as contributing to a resource management package in which many public jurisdictions have a part. The Plan is complementary to the planning and management responsibilities of municipalities and several Provincial ministries. The Plan defines what the Authority can contribute, within the limits of its legislation and funding, to the management of resources in the area over which it has jurisdiction.

While the separation of conservation activities into ten programs is a convenient mechanism for study, evaluation and management of resources, the Watershed Plan must be used as a package of resource management techniques which are to be applied to the resources of the area under the Authority's jurisdiction.

5.2 The Management of Resources in the Watersheds of The Metropolitan Toronto and Region Conservation Authority

The programs and policies of the Watershed Plan are seen as being applied to the major resource areas within the Authority's area of jurisdiction. In general terms, these resources are described as:

- . the river valleys, both well-defined and ill-defined;
- . the tributary drainage areas, including the Niagara Escarpment and the Oak Ridges Moraine;
- . the Lake Ontario Shoreline.

The conservation management of these resources, as set out in the Plan, recognizes:

- . the limitations of the resources to accommodate use and development;
- . the role of the area within the Authority's jurisdiction in accommodating municipal and Provincial growth objectives;
- . the requirement to protect the community from the hazards of flooding and erosion;
- . the role of resources in contributing to a safe and healthy life for the community;

the role of other public jurisdictions in contributing to the management of resources in the region.

5.2.1 Well-Defined River Valleys

In general terms, the well-defined river valleys include river mouth marshes and the lower reaches of the major streams. These streams rise in the Oak Ridges Interlobate Moraine and flow southward across bevelled till plains to the former Lake Iroquois Shoreline and thence to Lake Ontario. Over much of this route, the main tributaries have cut steep sided, deeply incised valleys with a flood plain that broadens as the stream flows southward. The well-defined valleys have the following characteristics:

- . the valley side slopes are steep and are often tree covered;
 - . the valley walls may be unstable;
 - . the flood plain usually has the appearance of being easily distinguished visually from the valley wall;
 - . the flood plain as defined by the Regional Storm will, in many instances, occupy the entire valley floor.
- Exceptions however will occur where valley formation processes or the activities of man have created a valley floor which lies outside the Regional Storm flood plain.

The policies and programs in the Watershed Plan which apply to the well-defined valleys have as their overall thrust, the retention of the well-defined valleys from top of slope to top of slope as natural units capable of passing Regional Flood flows, avoiding development that would be hazardous to life and property, and retaining the opportunity for preservation of the well-defined valleys as public open space areas consistent with municipal official plan policies. The contribution of the Authority's policies and programs to this overall thrust is set out in the Flood Control, Erosion and Sediment Control, Conservation Land Management, Watershed Recreation and Land Acquisition Programs.

The preferred strategies which these Programs represent were selected from a number of alternatives.

The continuance of a vigorous Land Acquisition Program would satisfy a large portion of the overall thrust. The initial acquisition costs and the long term management costs of such a program were considered to be beyond the reasonable funding expectations of the Authority and, where substantial portions of communities exist within the well-defined valley system, would create unacceptable disruption to the structure and economic life of the communities. The Land Acquisition Program sets out as the preferred strategy, a definition of hazard and conservation lands which are suitable for acquisition if other means of protection or control are not feasible and makes provision for a cooperative approach to acquisition between municipalities and the Authority where major acquisitions are required to satisfy both municipal and Authority objectives. A thorough analysis of the water storage approach to alleviating flood and erosion hazards within the well-defined valleys was carried out. Although it was found to be important to retain the option for the construction of water

storage reservoirs as may be required at some time in the future, the analysis clearly indicated that a site specific approach to remedial measures had a much more satisfactory cost/benefit ratio and produced fewer environmental problems.

The preferred strategy in the Flood Control Program is to carry out remedial measures in defined flood damage centres which will reduce the risk of flooding to 50% or less over the life of structures in the damage centre. The designation of the flood damage centres as special policy areas under the Province of Ontario's Policy for Flood Plain Management, will permit regulatory policies which will give further protection and which, in combination with a flood warning system, offers a satisfactory level of flood protection.

Analysis revealed that most streambank and valley wall erosion occurs during the more frequent flood events and that major storage reservoirs did not contribute substantially to reducing downstream erosion. For this reason the site specific approach for erosion control is also the preferred strategy. The Erosion and Sediment Control Program identifies the sites most in need of erosion control and recommends remedial measures to be carried out on the basis of technical priorities which recognize the degree of hazard.

Under The Conservation Authorities Act the Authority has made and administers regulations applicable in the area under its jurisdiction dealing with fill, construction and alterations to waterways. Within the well-defined valleys these regulations were found to be an important technique contributing to the overall thrust for valley management. Applied in isolation from other management techniques, however, regulation has many inadequacies. Without the flood remedial measures which are recommended for flood damage centres, the application of prohibitive regulations would have a severe economic impact on the community and individual property owners. In undeveloped valley areas regulation can prevent, in the short term, development in hazardous areas but does not satisfy public open space requirements, nor does it provide for the public management of environmentally sensitive and significant areas. The preferred strategy which the Plan recommends is the application of regulations made under The Conservation Authorities Act dealing with fill and construction and alterations to waterways, in hazard areas, using specific criteria which will contribute to consistency of application backed up by remedial measures and acquisition where regulation by itself is inadequate.

The application of conservation land management techniques including reforestation, shrub planting and stream improvements for fish management and sediment reduction have traditionally been reserved for headwater areas. The option of extending conservation land management programs into the lower well-defined valley areas was examined and substantial benefits were revealed. Many of the well-defined lower valleys have been subject to severe alteration and application of conservation land management techniques will contribute to valley restoration. The preferred strategy for the Conservation Land Management Program includes the extension of the program into the lower valleys, particularly, in urban areas in cooperation with municipalities.

The use of the well-defined valleys for public open space and recreation programs is a well established concept. The options of not managing valley lands for recreation but retaining them as natural areas and of having all

valley lands managed by the municipalities were examined. Well-defined valleys can perform a recreational function, but because of the requirement that they be capable of passing Regional Flood flows and their role as natural corridors, it was determined that intensive forms of recreation which require major structural facilities were incompatible. The question of municipal management of all Authority valley lands was given thorough public discussion as a result of recommendations made in the report of the Royal Commission on Metropolitan Toronto. The preferred strategy which the Watershed Plan recommends is to permit and encourage the public recreational use of valley lands; to avoid structures which are ancillary to recreation activities in the 100 year flood plain and to identify, through more detailed studies, those sections of the valleys which should be reserved from development and retained as environmentally significant areas. The Plan recommends that in the urban and urbanizing areas, municipalities be encouraged to assume the management responsibility of the valley lands, subject to Authority approval of management and development practices. The Plan recommends that further market analysis be done to determine the specific recreation role of lands which the Plan classifies as conservation areas, to be managed by the Authority. It recommends that the remainder of Authority lands be managed as forest and wildlife areas or resource management tracts. The distinction among these latter categories was determined on the basis of physical characteristics and the need and opportunity to provide all season recreation in conservation areas. The Plan makes a commitment to carry out further market research in conjunction with detailed conservation area master planning. The Plan recognizes that conservation areas, because of their location, physical attractiveness, and all-season recreation opportunities, contribute to the recreation life of the entire community and are not restricted to the benefit of any single municipality.

5.2.2 Ill-Defined River Valleys

Ill-defined river valleys are generally distinguished from well-defined river valleys on the basis of size and the side slope characteristics. Typically, an ill-defined valley will slope gently away from the flood plain and will be visually indistinguishable from the flood plain. Valley slopes are typically not wooded and top of slope can be determined only on an arbitrary basis.

The thrust of the Watershed Plan with respect to ill-defined valleys is similar to that for well-defined valleys, except that the definition of an ill-defined valley is the Regional flood plain plus ten metres. All of the options for management and preferred strategies which were established for the well-defined valleys apply in the ill-defined valleys, but there is typically more reliance on the application of Fill and Construction and Alterations to Waterways Regulations and less emphasis on land acquisition in the ill-defined valleys. This change in emphasis notwithstanding, the Plan provides for the possibility of acquisition where regulation alone cannot satisfy Authority and municipal objectives.

5.2.3 Mapping

The definition of well-defined and ill-defined valleys was developed on the basis of topographic mapping which was prepared for the area under the

Authority's jurisdiction. Because of the substantial costs involved, the mapping was limited to those watercourses which drain in excess of 1300 hectares. With the exception of works proposed in the Erosion and Sediment Control Program, all of the policies and programs which are applicable to the well-defined and ill-defined valleys are applicable to those unmapped stretches of the watercourses which drain less than 1300 hectares, and greater than 125 hectares. In these unmapped stretches of the streams the programs will be applied on the basis of mapping to be prepared, as required, by the Authority or any other proponent of works. In areas draining less than 125 hectares policies pertaining to the Authority's Conservation Land Management and Watershed Recreation Programs will apply.

5.2.4 The Tributary Drainage Area

The thrust of the Watershed Plan, as it deals with the tributary drainage areas of watercourses, is to have a positive impact on the quality and quantity of water that drains from the land. Clearly, this aspect of the Watershed Plan deals with land use which is a municipal responsibility. For this reason, the land use figures in the Plan are estimates of potential patterns to the year 2000 A.D. and are based on information provided from a number of sources, primarily municipal planning documents. The land uses shown in the Plan were used to estimate potential runoff and erosion rates and to formulate land management proposals. The showing, in the Plan, of lands which are now urban or which are likely to be urban, based on municipal plans, does not constitute an Authority endorsement of land use change.

The programs which contribute to the thrust of the Watershed Plan with respect to the headwater zones are Storm Water Management and Conservation Land Management.

The options which the Authority reviewed dealing with the headwater zones were:

- . to rely on its ability to comment on development proposals through the municipal planning process;
- . to establish and undertake a Storm Water Management Program;
- . to foster a program of conservation land management on both public lands and private lands.

As with the options which existed for management of the river valley system, no single option was found to be entirely adequate by itself. To simply rely on the municipal planning process and comment on development proposals would be inadequate because the Authority has important expertise and information systems which can contribute to urban and rural design. To concentrate solely on the programs which apply on private and public lands and not be involved in the municipal planning process, is similarly inadequate. Municipal planning control, expertise and legislative jurisdiction is essential to the management of drainage areas. Many new concepts in the management of storm water which will reduce flood flows and improve water quality, are being given consideration in almost all public and private sectors concerned with land development. Storm water drainage is primarily a municipal matter; however, again the Authority has

important expertise and information which should be available to municipalities in order that unnecessary duplication of effort does not occur. The preferred strategy set out in the Watershed Plan is a combination of all three options applied in a manner which will respect the municipal planning responsibilities, which will make available to public and private landowners Authority expertise in conservation land planning, and which will bring a conservation ethic to land use planning decisions.

The impact of development on the resources of the region, especially the impact of land use changes which occur in the upstream portions of the tributary drainage area are of interest because alterations in these areas can have effects throughout the watershed. Planning objectives common to all jurisdictions should include:

- . the maintenance and enhancement of water-related functions, including source areas and aquifer recharge;
- . the maintenance and enhancement of fish and wildlife habitat, particularly, cold water streams;
- . the protection of land from wind and water erosion as a result of poor land management practices, including lack of preventative measures during construction;
- . the maintenance of Class 1 to Class 4 agricultural lands in agricultural use, as much as possible;
- . the maintenance of the visual amenities and other greenspace functions of natural habitats and landforms in close proximity to the developing urban area.

Land use proposals in the tributary drainage areas should take into consideration the following:

- . changes in natural drainage of tributary streams and intermittent watercourses should be minimized. The elimination of such watercourses and of wetland areas through piping, channelization, filling or draining should be discouraged;
- . development should be set back from wetlands, lakes and streams in order to ensure protection of water bodies from water quality damage;
- . disturbance to natural vegetation should be minimized, particularly, adjacent to streams with cold water fishing potential;
- . removal of existing tree cover or other stabilizing vegetation should be minimized on all lands with potential for wind or water erosion. Re-vegetation will be encouraged where existing erosion occurs;
- . development over major recharge areas and aquifers should minimize the use of non-porous surfaces in order to maintain infiltration;
- . the Authority should cooperate with, and support other agencies in reviewing, development proposals to ensure these concerns are addressed and that development controls are

utilized to reduce potential impacts.

All of these considerations are important for any proposed development. They are of particular importance in those areas shown on the Authority's Watershed Plan map as not being predominantly rural.

The concept of storm water management forms an important new component for the Authority in its watershed management work. Because of the municipalities' legislative responsibility for management of storm drainage, no other option for dealing with storm water management was considered. The Storm Water Management Program recommends the Authority's role as being:

- . an advocate of good storm water management practice, including the adoption of the major/minor system approach to storm drainage, with the minor system carrying up to and including the 2 year storm event, and the major system designed to carry the Regional Storm event or the 1:100 year event, whichever is the greater;
- . the preparation of a master drainage plan by the Authority which sets out for the municipalities, drainage management objectives on a watershed basis;
- . the preference for natural channel designs;
- . the fostering of strong public and provincial support for storm water management concepts.

The Storm Water Management Program is given strong support in the Conservation Land Management Program which has as a preferred strategy, the employing of a variety of techniques which will encourage landowners, both public and private, to employ good land use practices. This program recommends that the Authority provide landowners, on a request basis, with conservation plans for their lands and that the plans be supported with assistance works including reforestation, wildlife shrub plantings, stream improvements and woodlot management. The program recognizes that the landowners do have options in seeking advice services with the Ministry of Natural Resources and the Ministry of Agriculture and Food. Different emphases in all of these assistance programs provide the landowner with a wide, but clear choice, in seeking the service which he requires.

5.2.5 The Lake Ontario Shoreline

For the purposes of the Watershed Plan the Lake Ontario Shoreline is defined as a longitudinal strip of land and water area extending southward from the lakeshore arterial roads to the international boundary, over the Authority's area of jurisdiction which extends from the Etobicoke Creek in the west to the Carruthers Creek in the east. The thrust of the programs which are directed to this resource are to provide safety from the hazards of erosion and flooding in shoreline areas and to provide public access and recreation opportunities appropriate to the shoreline setting. Two programs, Shoreline Management and

Lake Ontario Waterfront Development, contribute to the management of the Lake Ontario Shoreline resource.

The Authority's recreation and open space work along the Lake Ontario Shoreline has been based on the Waterfront Plan which was prepared for the Metropolitan Toronto Planning Area by the former Metropolitan Toronto Planning Board. This Plan has been updated on two separate occasions - in 1971 when the Authority's first Waterfront Plan was adopted and in 1977 when the second phase of the Waterfront Plan was adopted. Since the Plan had been recently rethought, the policies and objectives as set out in the Plan, with some modification, have been included in these programs.

In addition to the planning which the Waterfront Plan represented, alternatives in two important areas were considered. In determining the role that water storage could play in the Flood Control Program, the ancillary benefit of water-oriented recreation opportunities which flood control reservoirs represent, was considered and compared with water-oriented recreation opportunities which the Lake Ontario Waterfront Development Program represents. For a variety of reasons, including the accessibility of waterfront areas to large concentrations of population, the wider scope of water-oriented activities which the Lake Ontario Shoreline represented, and the limitations which the management of water storage reservoirs for flood control purposes placed on the use of the reservoir for recreation, the Authority concluded that the community would be most advantageously served if water resource recreation opportunities were developed along the Lake Ontario Shoreline in preference to additional water storage reservoirs.

Secondly, since shoreline management, including erosion control, did not have a large place in the original waterfront plans, the option of the Authority dealing with this important management activity in a separate program and giving it substantial emphasis, was considered. Because of the Authority's extensive experience in shoreline work and the urgent need for action which erosion studies indicated in certain areas of the shoreline, and the lack of another agency equipped to deal with the matter, a Shoreline Management Program is included in the Watershed Plan. The preferred strategy for the Lake Ontario Waterfront Development Program addresses itself to the creation of open space areas across the waterfront which will provide for a range of active and passive water-oriented activities for the people of the region. These activities include the development of a diverse sport fishery in cooperation with the Ministry of Natural Resources, the development of small craft safe anchorages at intervals along the shoreline and the preservation of the remaining river mouth marsh areas. The preferred strategy for the Shoreline Management Program emphasizes the control of erosion which occurs as a result of wave action and priority will be given to the most endangered areas of the Scarborough Bluffs. The studies carried out by the Authority indicated that shoreline management would best be carried out in design blocks which would enable the protection of natural units of the shoreline as opposed to individual properties.

5.2.6 Public Information

An important component of the resource management techniques which will be

applied to all the resources in the area under the Authority's jurisdiction is the provision of public information opportunities. The thrust of this technique is to develop an informed public on conservation matters and to develop public attitudes which are supportive of the conservation ethic. The provision of public information opportunities is addressed in the Community Relations Program. The options considered for the public information program were options which pertained to techniques and the audiences to be reached as opposed to looking at alternatives to a public information program. This approach was predicated on the belief that a public agency is obligated to have a public information program.

The traditional Authority information program has been one of general information brochures, reports of activities, news releases and multi-media presentations. All of these have been directed to a very general audience. In the course of the preparation of the information program and the public participation in that preparation, it became clear that a second option, that of directing Authority information to specific audiences (the engineering profession, landowners adjacent to river valleys, municipal and provincial legislators and similar specific groups that have a direct interest in Authority work) had to be considered. The preferred strategy which the Watershed Plan recommends is that the general information be continued but that increased emphasis be placed on a public information program directed at special audiences.

Alternatives were also considered with respect to the Authority's conservation education program. Since its inception, the Authority has conducted its conservation education program in a variety of ways. In the early years, most of the Authority's program was conducted through its conservation field centres which provide for residential conservation education experiences, in facilities owned and operated by the Authority on Authority-owned lands. Public hikes and educational tours in a variety of watershed locations also formed a part of the program. More recently, the Authority has been assisted in the provision of conservation education field centres by school board funding supplied for capital construction of field centre facilities. Educational tours and field trips have tended to be concentrated in the recently opened Kortright Centre for Conservation. During the plan preparation process considerable study and discussion was given to proposals by individual school boards to construct and operate their own facilities on Authority lands. The preferred strategy which the Watershed Plan recommends is to continue the policy of providing conservation education field centres on a cooperative basis with the school boards. This strategy will ensure that no single board has exclusive use of any one facility, thereby ensuring that the variety of experiences which are available at the different conservation education sites will continue to be available to all students within the school system. The Plan recognizes that the need for conservation education opportunities in the school system is not presently being met and recommends additional cooperative facilities at Albion Hills, the Boyd Conservation Education Complex and the Claremont Forest and Wildlife Area. The Plan recommends that the public conservation education opportunities continue to be concentrated at the Kortright Centre for Conservation. In so doing, quality experiences can be provided at reasonable

cost. It will continue to be the policy of the Authority that conservation education opportunities in connection with all its programs and all its facilities be available.

5.2.7 The Heritage Resource

Included in all of the major resource areas which the Authority manages is the opportunity to recognize and contribute to the conservation of the region's heritage resources. Included in all of the programs which make up the Watershed Plan is the commitment to conduct an environmental review as a part of the planning for the program, and in accordance with the requirements of The Environmental Assessment Act. The heritage resources which may exist will be identified and their management addressed. This commitment includes recognition of historic sites, buildings and archaeological sites. The preferred strategy which the Plan recommends is to recognize and contribute to the conservation of the region's heritage resources, placing emphasis on those which contribute to an understanding of resource management. The Heritage Conservation Program deals with the management of this resource. It is incumbent on a public landowner to be aware of the heritage resources represented by its lands and structures and to arrange for their recognition. This has been the traditional approach of the Authority and the Plan recommends that it continue.

5.2.8 Structure of the Authority as it Relates to Planning

The manner in which the Authority is structured to conduct its business is set out in Section 2.2 of this Plan. All of the component programs were reviewed at various stages of draft proposals by the appropriate Functional Advisory Boards. The Watershed Advisory Boards, which are issue oriented on a watershed basis, as opposed to program oriented, performed the important function of reviewing the program components on a watershed basis and recommending the balance of emphasis that should exist among the programs which make up the Plan. It was in the Watershed Advisory Board review process that the alternatives among programs were reviewed and the preferred strategies recommended.

Within the staff structure of the Authority provision is made for a Planning and Policy Committee on which technical divisions are represented. The role of the Planning and Policy Committee was to review the input to the programs by Authority staff, consultants, comments from municipalities, the Province of Ontario and citizen groups. Based on this input, the role that each component of the Plan should play in achieving overall watershed management was established.

It was in the Planning and Policy Committee that the alternative strategies were evaluated.

5.2.9 The Watershed Plan Programs

The sections of this chapter which follow provide a summary of each of the ten programs which make up the Watershed Plan. A complete program document has been prepared for each program and is bound separately from this Plan. For complete details the program documents should be referred to. Selected program graphics have been included in an appendix to this Plan.

5.3 FLOOD CONTROL PROGRAM

Flood plain management is the planning and implementation of measures intended to balance the needs of nature for flood water conveyance and flood storage with the demands of the community for use of the valley system. The Authority, through its Flood Control Program, will continue to implement comprehensive flood plain management including the construction of protective works, the acquisition of flood plain lands (see Land Acquisition Program), and the application of regulations adopted under Section 27(1) of The Conservation Authorities Act.

5.3.1 Policy

The goal of the Authority's Flood Control Program is:

TO UNDERTAKE A COMPREHENSIVE PROGRAM OF FLOOD CONTROL
DESIGNED TO PREVENT, ELIMINATE, OR REDUCE THE RISK OF
HAZARD TO LIFE AND PROPERTY, WHILE COGNIZANT OF THE
NATURAL ATTRIBUTES OF THE VALLEY SYSTEM.

In order to achieve this goal, the Authority has established the following objectives:

- ✓ (a) Under The Conservation Authorities Act the Authority has made and will continue to administer regulations applicable in the area under its jurisdiction dealing with the placing of fill, construction, and alterations to waterways in flood susceptible areas in order to prevent the creation of additional flood prone development. The administration of regulations will be in accordance with technical criteria devised to minimize future damage and to avoid the accumulative loss of storage which occurs through encroachment on the flood plain;
- (b) to recognize as suitable for acquisition, those lands which are susceptible to flooding under the Regional Storm and to acquire, within this category, such lands as may be necessary in order to have maximum control over their ability to safely accommodate flood flows and protect available flood storage;
- (c) to maintain a flood warning and forecasting system which will provide the earliest possible warning to the Authority's municipalities regarding an impending flood hazard;
- (d) to provide in defined flood damage centres, on a priority basis, protection that will reduce the risk of flooding to less than 50% over the life (100 years) of the affected structure(s). Protection to a higher level will be provided if economically and/or socially justified;

- ✓ (e) to seek the cooperation of municipalities in preventing the creation of new flood prone development through the incorporation of appropriate statements and designations concerning flood hazard areas in Official Plans and secondary plans (or their equivalent), and, to ultimately restrict development in such flood hazard areas through the enactment of restricted area bylaws (zoning) and/or development control bylaws;
- (f) to provide the municipalities with flood hazard information on which to base municipal land use controls and standards for flood plains;
- (g) to recognize the value of the natural valley system in the design and construction of all protective works and to maintain the natural character, where feasible;
- (h) to maintain an up to date data gathering system which will enable the Authority to provide accurate water management information to assist in the design and operation of Authority, municipal and private water management measures and to incorporate improved technologies as they become available;
- (i) to maintain flood control structures as required in order that they can continue to perform as designed.

5.3.2 Program Description

The objectives of the Flood Control Program will be accomplished through the continued implementation of preventative and protective measures.

To prevent the creation of additional flood prone development, the Authority will review development proposals on the basis of the following criteria:

A) UNDEVELOPED FLOOD PLAINS

- (a) In the application of its regulations for flood control, the Authority has mapped and plotted the flood plain for those watercourses draining 1300 hectares or greater. For development proposals in proximity to watercourses draining less than 1300 hectares, the Authority may require the proponent to provide the flood plain information.
- (b) Occupation of the flood plain for activities which do not require alteration to the flood plain and which do not interfere with the primary function of the flood plain are considered suitable. The following land uses are representative of appropriate activities:
 - agriculture
 - outdoor recreation/open space
 - gardens/nurseries/arboretums
 - other similar nonstructural uses.

Structures or buildings required for or associated with these activities may be permitted in the flood plain but must be located outside the 100 year flood zone provided that no potential for loss of life or substantial structural damage connected with such structures exists.

- (c) In keeping with the overall Authority objective of maintaining the valleys in a natural state, the use of flood plains for parking lots will be discouraged. However, if the need to utilize flood plains for parking lot purposes can be demonstrated, then parking lots must be located outside of the 100 year flood zone, and, in addition, must meet other parking lot criteria established by the Authority which takes into account flow velocity and depth of flooding. Further, the construction of parking lots cannot involve the introduction of fill material so as to raise the elevation of the parking lot to conform to Authority criteria.
- (d) It is recognized that certain utilities or services such as storm and sanitary sewers, natural gas or oil pipelines, hydro corridors, foot paths and transportation links will, from time to time, be required to cross or use the flood plain. Such uses should not impede flood flows or be located in such a manner as to cause adverse effects to the flood plain upstream or downstream.
 - (i) The construction of pipe or service lines should maintain the predevelopment configuration of the flood plain and minimize disturbance to existing vegetation. Pipe or service lines parallel to the flood plain should be constructed and protected so as to prevent scouring and possible failure at a later date. In addition, storm sewer outfalls should be designed to provide adequate protection to the river banks.
 - (ii) Where feasible, bridge or structural abutments should be located outside of the flood plain to minimize obstruction to water flow.
 - (iii) Where structures are necessary within the flood plain the structure should be designed so that overtopping or flanking can occur with a minimum of damage. Major bridges not designed for the Regional Flood should have their approach ramp(s) designed as spillways. Smaller footbridges should be designed to withstand blockage and allow for spill.
- (e) Spill zones occur in areas where the valley is ill-defined resulting in a broad, uncontained exit for flood waters. As a consequence, it is extremely difficult to accurately determine the limit or depth of flooding.

The exact delineation of the flood plain for a spill zone shall be determined by the Authority on a site specific basis. The artificial delineation of this flood plain will take into account the average width

of the natural flood plain upstream and downstream, and, possible upstream and downstream effects.

Development will not be permitted in the defined flood plain except for those activities identified previously.

Prior to development in the remaining portion of the spill zone, that area should be protected to the level defined by the Regional Storm. No new development will be permitted until protective works have been installed to the satisfaction of the Authority.

B) DEVELOPED FLOOD PLAINS

Flood plain areas on which there is a concentration of development which forms an integral part of an existing community have been defined by the Authority as flood damage centres. As such, acquisition of entire damage centres is considered to be economically and/or socially unacceptable. Therefore, infilling, additions, or redevelopment may occur in damage centres subject to the following criteria:

- (a) The location and extent of damage centres will be determined by the Authority in consultation with the appropriate municipality(ies);
- (b) Within a damage centre, all new structures or buildings must be protected to the degree that the risk of flooding is no higher than that established by policy. As a general guideline, structures or buildings will not be subjected to flooding under the Regional Storm. However, where it is demonstrated that this level of protection is technically not achievable, then as a minimum, structures or buildings will not be subjected to a risk of flooding over their assumed life of 100 years, in excess of 25%. Several flood damage reduction techniques can be applied to achieve this level of risk, including fill, elimination of openings, and strengthening of foundations;
- (c) Notwithstanding criterion (b), no development, redevelopment or additions will be permitted where they will be subjected to flows which due to their velocity and/or depth would be a hazard to life or susceptible to major structural damage as a result of a flood less than or equal to the Regional Storm;
- (d) For the development or redevelopment of all or part of a damage centre that is also a spill zone, the spill zone should be protected to reduce the risk of flooding to the required level prior to any development or redevelopment. Every attempt should be made in the grading of spill zones to allow for the passage of flood water through streets without adverse effects on buildings.

In addition to Flood Damage Centres, other smaller susceptible areas exist consisting of a single affected structure or a small group of structures. These areas have been designated as Flood Vulnerable Areas.

Flood Vulnerable Areas will be addressed in the following manner:

Flood Vulnerable Areas: subject to a cost/benefit analysis, and the requirements or considerations of any other Authority Program(s), residential, commercial or industrial structures will be acquired or protected to the level of the Regional Storm, over the long term, on a priority basis which is dependent on degree of risk.

In these areas, no infilling, additions or redevelopment should be permitted.

The majority of sites designated as Flood Damage Centres can be protected using site specific remedial measures. Lands previously purchased by the Authority as locations for dams and reservoirs will be retained in the event that they may be required in the future. These lands will be managed in a manner which will not reduce their potential as reservoir sites.

The Authority will also continue to operate and improve its flood warning and forecasting system as a protective measure.

Funding for the Flood Control Program will be based on 55% from the Province in grants and 45% Authority funds, raised through a levy on the member municipalities. The levy for the preventative review of proposals, the implementation of the flood warning and forecasting system, and the maintenance of capital works will be based on all municipalities designated as benefiting and apportioned according to equalized assessment. The levy for the capital cost of flood control remedial works will be assigned to the municipality where the works are located.

5.4 EROSION AND SEDIMENT CONTROL PROGRAM

The Authority will continue to implement a program designed to minimize the aggravation or creation of erosion and sediment problems through a combination of preventative and protective measures. Both erosion and sedimentation are naturally occurring physical processes, however, the changes induced by man's activities can result in significant acceleration. The Authority will attempt to prevent the development of future problems and, where a hazard currently exists, may provide protective works or acquire endangered property (see Land Acquisition Program).

5.4.1 Policy

The goal of the Authority's Erosion and Sediment Control Program is:

TO MINIMIZE THE HAZARDS OF EROSION TO LIFE AND PROPERTY,
AND TO IMPROVE THE QUALITY OF THE STREAMS AND LAKES THROUGH
SELECTIVE CONTROLS ON SEDIMENT SOURCES.

In order to achieve this goal, the following objectives have been identified:

- (a) Under The Conservation Authorities Act the Authority has made and will continue to administer regulations applicable in the area under its jurisdiction dealing with the placing of fill in designated erosion hazard areas to prevent the occurrence of further erosion damage;
- (b) to seek the cooperation of municipalities in preventing the creation of new erosion prone development through the incorporation of appropriate statements and designations concerning erosion hazard areas in Official Plans and secondary plans (or their equivalent), and, to ultimately control development in such hazard areas through the enactment of restricted area bylaws (zoning) and/or development control bylaws;
- (c) to seek the cooperation of municipalities in making the preparation of an erosion-sediment control plan a condition of approval for draft plan of subdivision;
- (d) to cooperate with municipalities and landowners during the design of urban drainage systems so as to incorporate into these systems mechanisms for controlling increases in flow and sediment;
- (e) to implement a program of major and minor remedial works for the control of erosion and sediment loss;
- (f) to recognize the importance of the natural valley character in the design of remedial works wherever feasible;
- (g) to continue to update and augment the current state of the art regarding erosion and sediment control in the Authority's jurisdiction.

5.4.2 Program Description

In carrying out the preventative component of this Program, the Authority will review development proposals on the basis of the following criteria:

- (a) For lands immediately adjacent to valleys, buildings or structures (including paved surfaces), whether situated above or below ground level, should not be permitted in the following erosion impact zones unless studies by a competent professional show that the structures will be safe during their life, which for Authority purposes is 100 years, and that the buildings or structures will not aggravate or create erosion problems:

- 10 meters back from the top of bank where a stable, defined valley exists;
- 10 meters back from a projected 2H:1V slope where an unstable, defined valley exists; and
- 10 meters back from the Regional Storm floodline where an ill-defined valley exists.

NOTE: Unless shown to be otherwise, the average stable slope is assumed to be 2H:1V.

- (b) Surface drainage from any building, structure or paved surface should not be permitted to be discharged over the valley wall. Such surface drainage should be directed away from the face of the valley wall or appropriately piped to the base of the valley wall.
- (c) The municipalities be encouraged to have Master Drainage Plans (as described in the Storm Water Management Program) prepared for developing areas which will then be complied with as the individual subdivisions or developments are undertaken.
- (d) In conjunction with the municipalities and other appropriate agencies, the Authority shall endeavour to have storm water management methods incorporated into new development. Such methods could include, but not necessarily be limited to, the following:
- temporary storage of rainfall on flat roofs, parking lots
 - detention storage ponds
 - in pipe storage
 - diversion of rain water leaders on to grassed areas.
- (e) The preparation of an erosion-sediment control plan should include mechanisms designed to maximize on site sediment control during active construction. Such mechanisms could include but not necessarily be limited to the following:

- temporary vegetation of stock-piled earth and exposed construction sites
- retention of vegetation buffer strips
- diversion ditches for runoff
- sediment traps and basins
- temporary drainage contouring
- straw bale filters, particularly in proximity to watercourses
- storm water management.

(f) The Authority shall endeavour to increase public awareness of the problems of erosion control and sediment reduction by disseminating information and providing technical advice, where appropriate.

In implementing the protective component of the Program, the following operational criteria will be used as a guide:

- (a) Watercourses or parts thereof on which the erosion protection works set out in this Program are applicable are generally those which drain an area equal to or greater than 1300 hectares. Watercourses which do not meet this specific criterion but which in the opinion of the Authority have physical characteristics which require their inclusion for Erosion Control works have been included. These streams include the Newtonbrook Creek to Finch Avenue and the Centennial Creek to Kingston Road. Watercourses or parts thereof which generally drain an area less than 1300 hectares shall be the responsibility of the municipalities for the undertaking of erosion protection works.
- (b) Except where defined otherwise, top of valley slope to top of valley slope shall be described as the area in which the Authority will undertake remedial works to control erosion and sediment loss.
- (c) In assessing the severity of an erosion problem, a priority or ranking shall be given to each site. The priorities shall then serve as the basis for the development of an annual erosion works program. A priority shall be based on technical criteria including, but not necessarily limited to the following:
 - distance from top of bank to structure
 - extent of seepage
 - ground water conditions
 - steepness of slope and height
 - soil composition
 - vegetative cover, type and extent
 - evidence of previous movement

The procedures, parameters and weighting factors that contribute towards the establishment of a priority system shall be periodically reviewed to ensure

the inclusion of new ideas and techniques.

- (d) For the purposes of erosion protection works, design blocks shall be established and works undertaken on a design block basis. Design blocks shall be of a size to be technically and economically feasible.
- (e) Where erosion protection work is proposed on private land, the Authority shall require title to the land or an easement where applicable, and/or require a suitable financial contribution from the benefiting owner(s).
- (f) Erosion protection works will be analysed on the basis of cost/benefit, with acquisition cost being used as a principal determining factor.
- (g) Design criteria for erosion protection works are dependent upon the nature of each specific problem. Generally two types of problems exist, the first, and less common type, involves a bank or valley wall instability, in which slumping or major rotational failure is involved due to inherent soil conditions or overloading of the bank. The more common type of problem involves the river in coincidence with a valley wall. Wherever possible, erosion control work shall be designed to:
 - accommodate the 100 year flood for the 'coincident case'
 - accommodate the 10 year flow, in all other cases as a minimum, based on the ultimate development of the watershed
 - permit channel overtopping with minimal damage to the remedial work
 - decrease the velocity of the stream by flattening the hydraulic gradient and minimizing the flow energy - by incorporating meanders and/or controlled drop structures
 - increase roughness of the watercourse by a wide selection of design materials
 - consider park/open space plans of other public agencies in the design of remedial works.
- (h) In assessing the severity of sediment loss problems, a priority or ranking shall be given to each site. The priorities shall then serve as the basis for the development of annual sediment reduction programs. A priority shall be based on technical criteria including, but not necessarily limited to the following:
 - physical extent of the problem
 - amount of material reaching the watercourse
 - soil composition
 - steepness of slope and height, if applicable.

The procedures, parameters and weighting factors that contribute towards the establishment of a priority system shall be periodically reviewed to ensure the inclusion of new ideas and techniques.

(i) In the design of all protection works, the Authority or any other proponent shall be cognizant of the natural surroundings and shall endeavour to provide ancillary benefits, where appropriate.

(j) In order to minimize the impact of remedial works on the valley ecosystem, an 'Environmental Inventory' shall be undertaken prior to the initiation of any works. Included in the inventory are:

- site description
- dominant overstory, understory and groundcover
- percent of cover types
- fauna species and habitat areas
- aquatic data (where applicable) includes benthic, sediment and chemical analysis
- significant features and/or species
- disturbances
- evaluation of site and proposed access
- recommendations considered as input to the planning, design and implementation of the proposed work.

Funding for the Erosion and Sediment Control Program will be based on a 55% Provincial grant with the remaining 45% raised by a levy on the Authority's member municipalities.

5.5 STORM WATER MANAGEMENT PROGRAM

Storm water management may be defined as the planning, analysis and control of storm water runoff to achieve specified objectives. In the past, the objective for handling storm drainage was to remove the surface water from developed areas as quickly as possible. While such practice ensured local convenience, it increasingly resulted in downstream flooding and erosion and thus the need for remedial works programs. The objective of storm water management, on the other hand, is to control storm water in upstream areas near its source and to regulate its discharge to the watercourses so as to minimize or prevent adverse impacts.

The Authority recognizes that sound storm water management can only be achieved through municipal/Authority cooperation. The Authority's Storm Water Management Program reflects this need and presents the preparation of master drainage plans as a formal means by which such cooperation may be achieved.

5.5.1 Policy

It is the goal of the Authority's Storm Water Management Program to:

PROMOTE SOUND STORM WATER MANAGEMENT PRACTICES WHICH WILL
ENSURE ADEQUATE FLOOD AND EROSION PROTECTION, AND WILL
ENHANCE THE ENVIRONMENTAL, AESTHETIC, AND RECREATIONAL
POTENTIAL OF URBAN WATERCOURSES.

To achieve this goal, the following objectives have been defined:

- (a) To endeavour to ensure that the management of storm water be given early consideration in the planning and development of new urban areas.
- (b) To encourage the municipalities to include in Official Plans, particularly for developing areas, statements supporting the concept of and need for storm water management, and, the preparation of master drainage plans at a comprehensive scale at the appropriate time in the planning process.
- (c) To cooperate with municipalities in the preparation of master drainage plans.
- (d) To ensure that master drainage plans are prepared in accordance with the valley management, flood control, and erosion and sediment control policies and programs of the Authority.

- (e) With regards to objective (d), to formulate design criteria for the major system so as to prevent damage as a result of surface flooding, and for the minor system so as to minimize downstream erosion and sediment problems.
- (f) To encourage the use of storm water management facilities which are practical, beneficial, and which take into account environmental and aesthetic considerations.
- (g) To encourage an awareness of the concepts and benefits of storm water management and its relationship to other Authority water management programs.

5.5.2 Program Description

The successful implementation of a comprehensive storm water management program can only be realized if the concept and the broad objectives are identified in municipal official plans. In so doing, the municipal planning process would become the framework through which storm water management would be implemented.

The Authority recognizes that areas within its jurisdiction are considered to be "fully urbanized", as such, the application of storm water management would be somewhat limited. Conversely, with municipalities which are not considered to be "fully urbanized", particularly the upper portions of the watersheds within the Authority's jurisdiction, the full application of storm water management is possible.

A major principle of storm water management is the minimization of impacts on the system as a whole as a result of new development.

As the Authority is based on watershed and not political boundaries, the Authority would appear best suited to fill the "overview" role. Since a municipality controls land use and storm drainage, it would appear best suited to determine specific impacts as a result of any development proposal.

In implementing storm water management the Authority is proposing a two part Master Drainage Plan. Part I of the Master Drainage Plan would be the watershed overview and would be the responsibility of the Authority. Part II of the Master Drainage Plan would implement storm water management as part of development proposals based on design criteria and constraints identified in Part I and would be the responsibility of the local municipality.

In preparing Part I of a Master Drainage Plan on a watershed basis, the Authority would address five major areas - flood control, erosion control, water quality, base flow, and environmental. As a result of a watershed inventory, the Authority would identify any constraints or development criteria that would be required.

In order to provide early inclusion of storm water management in the planning process, the Authority is of the opinion that Part II of a Master Drainage Plan should be prepared as part of the Secondary Plan (or equivalent) process.

Alternatively, Part II of a Master Drainage Plan could be prepared on a portion of a watercourse or a tributary.

The function of Part II of a Master Drainage Plan should be to determine any impacts of proposed development on Part I and to identify how the impacts would be mitigated through a comprehensive storm water management system. With Part II of a Master Drainage Plan in place, the appropriate portions of the storm water management system could then be included in the more detailed planning processes of plan of subdivision and site plan preparation.

The Authority has established several operational criteria which it feels are necessary to achieve water management goals and objectives and which should be considered in any master drainage plan exercise:

- the minor or 'convenience' system should be designed to control to predevelopment conditions, all flows up to and including the 2 year storm, as a minimum. However, if as a result of the preparation of a Master Drainage Plan Part II, a more desirable level of control is determined, then that
- design event would be utilized;
- all major drainage system components, irrespective of drainage area, be designed to accommodate the greater of the 1 in 100 year or the Regional storms post-development surface flows. The criteria for controlling flows in the major system should be determined through the master drainage planning process;
- the Authority encourages the use of natural channel design concepts. The basic aim of natural channel design is to create a stream channel analogous to a configuration which would occur under natural conditions. In general, this means that the channel is constructed as a meandering low flow channel within a floodway;
- flood plains that would result from the greater of the 1 in 100 year or Regional storms would have to be defined for predevelopment and post-development conditions. In this regard, the Authority is concerned about increases in peak flows, where the cumulative effect of such increases would adversely impact upstream or downstream conditions.

The Authority recognizes that the preparation of master drainage plans cannot occur instantaneously, nor can planning and development be halted until such plans have been prepared. In the absence of master drainage plans, the following is suggested to serve as a guide:

- where a Secondary Plan (or equivalent) is being prepared and a Master Drainage Plan Part I does not exist, then the intent of Part I should be adhered to as much as possible in the preparation of a Master Drainage Plan Part II. In this

regard, the Authority would provide any existing Part I data to the local municipality as input to the process;

- where a plan of subdivision is being prepared and a Master Drainage Plan Part I and Part II does not exist, then sound storm water management techniques should be incorporated into the plan of subdivision, where appropriate. Such techniques should include the preparation of an erosion/sediment control plan as a condition of draft plan approval;
- where development is proposed and a Master Drainage Plan does not exist, the minor system should be designed to control to predevelopment conditions, all flows up to and including the 2 year storm, as a minimum;
- where development is proposed and a Master Drainage Plan does not exist, the major system should be designed to control to predevelopment conditions, all peak flows up to and including the 100 year flood. If a proponent wishes to pass post-development peak flows that are greater than the corresponding predevelopment peak flows, he then must be able to prove that the cumulative effect of such an increase would have no adverse impact upstream or downstream.

Funding for the Storm Water Management Program will be based on a 55% Provincial grant with the remaining 45% raised by the Authority through a levy on its member municipalities.

5.6 LAND ACQUISITION PROGRAM

The Authority will continue to define, within its area of jurisdiction, certain headwater, valley and waterfront lands as suitable for acquisition. Within the Land Acquisition Program, the areas included are defined as hazard and conservation lands. The designation of lands which may be acquired under this Program, does not limit purchase of property under other programs, including those required to implement the open space and recreational objectives of the Lake Ontario Waterfront Development Program. In addition, the Authority may adopt special projects for the acquisition of specific properties beyond those identified in the Watershed Plan, where municipal and provincial interest and funding is designated.

5.6.1 Policy

The goal of the Authority's Land Acquisition Program is:

TO ACQUIRE HAZARD AND CONSERVATION LAND IN ORDER TO PROTECT IT AGAINST UNWISE LAND USE WHICH WOULD AFFECT THE ABILITY OF THE LAND TO PERFORM ITS NATURAL FUNCTIONS, AND TO CONSERVE SIGNIFICANT AND SENSITIVE LAND FOR THE BENEFIT OF THE PEOPLE OF THE REGION.

The objective of the Program will be to recognize the suitability for acquisition of:

- (a) those hazard lands which are defined as being flooded by the Regional Storm.
- (b) those lands which, due to physical hazards of slope instability and/or unstable soils, are not suitable for development;
- (c) those conservation lands of a significant and/or sensitive natural character which are best managed by a public agency to retain their natural characteristics.
- (d) subject to suitable arrangements, those lands which when combined with hazard and conservation lands are identified from time to time by the Authority in cooperation with member municipalities of the Province of Ontario as being complimentary to hazard and conservation land acquisitions.

Properties specifically required for the Lake Ontario Waterfront Development Program and the Watershed Recreation Program would be acquired under those respective programs.

5.6.2 Program Description

Hazard lands are those susceptible to a specified risk from flooding or erosion. The Authority may acquire such hazard lands as described in the following areas:

- (i) those lands defined by the flood plain of the Regional Storm generally draining in excess of 1300 hectares;
- (ii) those lands along the waterfront defined by the 100 year flood level plus wave uprush;
- (iii) those lands along the river valleys generally draining in excess of 1300 hectares or along the waterfront which, due to hazards of unstable slopes or soils, make them undevelopable or untenable if already developed.

Conservation lands are significant or sensitive areas requiring public protection in order to retain their natural character and/or water related function. The Authority may acquire certain conservation lands, including:

- (i) those significant valley lands generally draining in excess of 1300 hectares and waterfront lands which warrant conservation. These lands generally lie between the flood limit and top of bank;
- (ii) those lands which are environmentally sensitive that abut or lie within a valley, the waterfront or are part of the headwater zone, and should not be altered. Designation of these lands will be on the basis of criteria adopted by the Authority and will emphasize water related or hydrologic characteristics.

Acquisition under this Program will be affected by the availability of properties on the market and of funds for purchase. High priorities will be in areas of hazard; in areas where urbanization is beginning to encroach; and as a preventative measure. Management of lands acquired under this Program must reflect their natural resource needs and are addressed in the Conservation Land Management and Watershed Recreation Programs.

Funding will be based on a 55% Provincial grant with the remaining 45% raised by the Authority through a levy of its member municipalities. The following will determine the basis of the levy:

- (a) generally benefiting (all municipalities contributing on an equalized assessment basis)

- all riverine flood plain land; the benefits of these go beyond municipal boundaries
- all environmentally sensitive lands; the benefits of these go beyond municipal boundaries

benefit to the people of the entire region and the generations to come

- significant valley and waterfront lands; these are significant features within the Authority's region and contribute to the quality of life in the Authority's jurisdiction as a whole.

(b) benefiting municipality (specific municipality contributing as the major part of the benefit is for a limited area.)

- erosion-related sites; the acquisition of these areas varies with each regional municipality and is dependent on interest in erosion control and extent of the problem
- waterfront flood-vulnerable areas; flooding on the waterfront is related to site specific features and there is no benefit to adjacent municipalities
- other valley or waterfront lands; depending on the extent, certain valley or waterfront land may be particularly important to acquire from a municipal point of view; where there is special benefit to a municipality, it should contribute the full Authority share.

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5.7 CONSERVATION LAND MANAGEMENT

The Authority will continue to manage its lands to exemplify sound reforestation, fish and wildlife, and soil conservation practices, and to provide assistance to public and private landowners in the planning and management of their lands to accomplish similar resource management objectives.

5.7.1 Policy

It is the goal of the Authority's Conservation Land Management Program to:

CONTRIBUTE TO THE QUALITY OF LAND AND WATER RESOURCES THROUGH A COMPREHENSIVE PROGRAM OF CONSERVATION LAND MANAGEMENT, INCLUDING FOREST MANAGEMENT, WILDLIFE HABITAT IMPROVEMENT, STREAM IMPROVEMENT, SOURCE AREA PROTECTION, AND CONSERVATION LAND PLANNING.

The objective of the Program will be to:

- (a) implement a formal program, providing technical assistance and advice services to private landowners and public agencies in an effort to maintain sound conservation management practices and benefits on all lands within the region. This program will include a more active involvement, on the part of the Authority, in commenting on and participating in the management concerns of urban areas;
- (b) cooperate with municipalities and other public agencies in establishing regulatory controls to reduce erosion and sedimentation on rural and urban lands. Of particular concern are: the rural areas including the headwater regions of the Oak Ridges Interlobate Moraine, where erosion and sedimentation from construction sites, agricultural lands and water diversion structures are of serious consequence; and, urban areas where development is proposed for areas susceptible to erosion and sediment generation;
- (c) cooperate with municipal and public agencies to identify, protect and conserve areas of biological and hydrologic significance and sensitivity, in both the valley systems and the headwater regions of the Moraine. As information is acquired, conservation and management of these areas will be dealt with on an individual basis;
- (d) carry out a program of vegetation management in the rural and urban sections of the region's watersheds to control erosion and sedimentation, retain the moisture holding capacity of the soil, extend wildlife habitat, provide

timber products, and enhance the visual quality of the region;

- (e) enhance the fisheries habitat on all streams through a program of stream improvement, with particular attention to expanding the cold water fisheries potential of private, public and Authority owned lands; and
- (f) lease lands to private and public agencies for agricultural and recreational purposes, ensuring that these lands are used in a manner compatible with the Authority's concerns for soil and water conservation.

5.7.2 Program Description

The implementation of this Program is embodied in two components, Conservation Planning and Conservation Management.

Within the Planning component Authority staff will provide technical assistance and advisory services to coordinate resource management on private, public and Authority lands both in rural and urban areas. Conservation plans will be developed for appropriate public and private lands recommending the most effective means of managing site resources. In rural areas properties must be larger than ten hectares. Criteria for the selection of urban properties for similar planning assistance will be developed in order to implement Authority objectives. Major Authority holdings, including those managed by other public agencies, will have management plans prepared based on site inventories of resources.

The Conservation Management component will provide a practical means of achieving resource management objectives through implementation of the recommendations of the Planning function. Works may include a combination of reforestation, woodlot and plantation management, tree and shrub planting, plant propagation and stream improvements. The Authority will work on both public and private properties on the basis of requests for assistance and may require an owner contribution. Requests will be prioritized on the basis of location within the watershed and property size.

Funding for this Program will be based on a 50% or 55% provincial grant with the remaining amount raised by the Authority through a levy on its member municipalities. Where appropriate, an owner fee or contribution will be required.

5.8 WATERSHED RECREATION PROGRAM

The Authority will continue to acquire lands within its area of jurisdiction, as described elsewhere in this Plan. Where lands acquired are capable of supporting public use for recreation, the Authority will develop and manage its lands to provide these opportunities or will lease its lands to other agencies able to plan and implement compatible resource-based recreation.

5.8.1 Policy

The goal of the Authority's Watershed Recreation Program is:

TO CONTINUE TO PROVIDE OPPORTUNITIES FOR PUBLIC ACCESS TO AUTHORITY LANDS, WHERE THE PUBLIC CAN ENGAGE IN OUTDOOR ACTIVITIES REQUIRING A NATURAL SETTING AND ACQUIRE AN APPRECIATION OF THE REGION'S RESOURCES THROUGH RECREATION.

The objectives of the Program will be to:

- (a) Designate tracts of land for outdoor recreation purposes ensuring that the recreation activities undertaken are compatible with other resource management goals and objectives of the Authority;
- (b) Encourage close cooperation of all agencies engaged in the provision of outdoor recreation opportunities to ensure that the residents of the Toronto region are well served with a diverse range of recreation opportunities provided in a cost-effective manner;
- (c) Manage all designated recreation lands and facilities to ensure the continuance of a recreation resource;
- (d) Undertake planning and management studies to augment, evaluate and update information relating to the provision of outdoor recreation on Authority lands;
- (e) Make available Authority lands, particularly those acquired in urban areas, to the Authority's member municipalities for open space purposes, ensuring that the land base is utilized in a manner consistent with the Authority's water management objectives;
- (f) Plan, manage and develop recreation facilities on conservation land in a manner which best suits the physiographic features of the area.

5.8.2 Program Description

Lands identified for compatible recreational use will be designated for management as:

- . Conservation Areas
- . Forest and Wildlife Areas, or
- . Lands suitable for lease by other agencies.

The Authority will manage the first two categories. Conservation Areas will provide a broad range of outdoor recreation opportunities supported by the development of facilities and services. Forest and Wildlife Areas will provide certain outdoor opportunities with limited site development but including provision for public access. Development in all areas will be on the basis of approved plans.

Where Authority lands are leased to other agencies for recreation and open space purposes, the Authority will work closely with the leasing agency to ensure that development proposals are compatible with resource management objectives.

Funding for Authority development of lands in the Watershed Recreation Program will be on the basis of a 50% Provincial grant with the remaining 50% raised by the Authority through a levy on its member municipalities. Provincial grants are not presently available for operation costs related to revenue-producing properties. In these instances, operating costs will be raised through user fees and municipal levy.

5.9 LAKE ONTARIO WATERFRONT DEVELOPMENT PROGRAM

The Authority will continue to implement the proposals of the 1967 Waterfront Plan, providing water-oriented regional open space. This work will be carried out on the basis of approved Master Plans, maximizing water-oriented activities, including boating, swimming, fishing, open space uses in conjunction with the waterfront, the preservation of significant natural and historical areas, and providing public access by land and water. Future work will expand the land base for these opportunities and provide primary development at specific sites.

5.9.1 Policy

It is the goal of the Authority's Lake Ontario Waterfront Development Program to:

CREATE A HANDSOME WATERFRONT, BALANCED IN ITS LAND USES,
WHICH WILL COMPLEMENT ADJACENT AREAS, TAKING COGNIZANCE
OF EXISTING RESIDENTIAL DEVELOPMENT AND MAKING ACCESSIBLE,
WHEREVER POSSIBLE, FEATURES WHICH WARRANT PUBLIC USE.

In order to achieve this goal, the Authority has established the following objectives:

- (a) to acquire or create open space areas at regular intervals across the waterfront which can provide for a range of passive activities for the people of the region;
- (b) to seek opportunities to incorporate public recreational uses on public and quasi-public lands where such uses would not conflict with their present use. Should such lands cease to be used for their present public purposes, the Authority will, when appropriate, seek to retain them for waterfront purposes;
- (c) to encourage the linking of waterfront open space corridors with those of the river valleys;
- (d) to develop diverse sport fishing opportunities through habitat improvement and improved access in conjunction with the Ministry of Natural Resources' fisheries management program.
- (e) to create, at regular intervals along the Lake Ontario shoreline, small craft areas which will provide safe harbourage for the boating public, as well as day and seasonal mooring facilities;
- (f) to encourage the preservation of the remaining lower valley marsh areas by discouraging further intrusion of intensive

recreational uses like power boating facilities in the lower valleys;

- (g) to cooperate with other agencies and particularly adjacent Conservation Authorities, who are undertaking waterfront planning and development;
- (h) to augment the present state of knowledge of lake processes by further research, data collection and analysis, including the assessment of the effect of developments undertaken in the area under the jurisdiction of the Authority;
- (i) to cooperate with all agencies concerned with improving the water quality of Lake Ontario in the area under the jurisdiction of the Authority.

5.9.2 Program Description

The Authority's proposals for Lake Ontario Waterfront Development will retain, acquire or create a variety of public open space opportunities across the waterfront; preserve, through careful management, the remaining undeveloped natural areas; recognize sites of historical significance in any development proposals; provide facilities for non-organized boating activities and a stable land base for organized boating activities; improve access to the shoreline and provide spawning areas to encourage fishing opportunities; and provide beaches for waterfront use as part of the headland and bay landfill construction technique.

The lands developed under this Program in Metropolitan Toronto will be managed, under agreement, by the Metropolitan Parks and Property Department. Outside Metropolitan Toronto, lands may be managed by agreement, by the local municipality, where there is a local parks requirement, or by the Authority's Conservation Land Management Division.

Funding for the Program will be based on a 50% grant from the Province of Ontario and 50% raised by the Authority on the following basis:

- 95% - levy from the waterfront municipalities of Metropolitan Toronto and the Region of Durham
- 5% - levy from the non-waterfront municipalities of the Regions of Peel and York, and the Townships of Mono and Adjala.

5.10 SHORELINE MANAGEMENT PROGRAM

The shoreline of Lake Ontario, being composed of highly erodable sands, silts, clays, tills and gravels, is constantly subject to modification by the physical processes of wave action, fluctuations in lake levels, seepage, surface erosion, slumping, gulleying, and the action of wind and ice. Shoreline management involves the planning and implementation of measures intended to balance the actions of nature with the demands of man for use of the shorelines for open space or development.

5.10.1 Policy

It is the goal of the Authority's Shoreline Management Program:

TO UNDERTAKE A COMPREHENSIVE PROGRAM OF SHORELINE MANAGEMENT DESIGNED TO PREVENT, ELIMINATE, OR REDUCE THE RISK OF HAZARD TO LIFE AND PROPERTY, WHILE COGNIZANT OF THE NATURAL ATTRIBUTES OF THE LAKEFRONT SETTING.

In order to achieve this goal it is the objective of the Authority to:

- (a) seek the cooperation of municipalities in preventing the creation of new hazard prone development through the incorporation of appropriate statements and designations concerning hazard areas in Official Plans and secondary plans (or their equivalent), and, to ultimately control development in such hazard areas through the enactment of restricted area bylaws (zoning) and/or development control bylaws;
- (b) cooperate with all agencies concerned with improving the water quality of Lake Ontario in the area under the jurisdiction of the Authority;
- (c) carry out works along the shoreline of Lake Ontario in accordance with proper shoreline management principles. Works will primarily be of a type and design which will form a part of an integrated management system for the entire shoreline, will limit abnormal erosion at the land/water interface, will enable public access along the water's edge, and will be conducive to beach maintenance;
- (d) cooperate, where possible, with municipalities, other government agencies and private owners in establishing criteria for their shoreline works which will be consistent with the Authority's shoreline management policy.

5.10.2 Program Description

The Authority's Shoreline Management Program incorporates both prevention and protection as measures to alleviate existing and potential shoreline hazard. The prevention component requires the recognition of shoreline hazards in establishing setbacks for development or redevelopment, the provision of assistance to private owners in the design of shoreline works, and regular monitoring of potentially hazardous areas. To minimize shoreline hazard the following review criteria will be utilized:

- i) Buildings, structures, or additions, (including paved surfaces), whether situated above or below ground level, should not be permitted in the following hazard impact zone, unless studies by a competent professional show that the buildings, structures, or additions will be safe during their life, which for Authority purposes is 100 years; and that the buildings, structures or additions will not aggravate existing, or create additional, problems:
 - 10 meters back from the 100 year wave uprush line as determined in the Great Lakes flood and erosion-prone area mapping where no definable bank exists; or
 - 10 meters back from the estimated 100 year erosion limit or if such information is not available, 10 meters back from the anticipated 2H:1V slope for unprotected eroding shorelines; or,
 - 10 meters back from a stable bank (for Authority purposes assumed to be 2H:1V slope).
- (ii) Surface drainage from any building, structure or paved surface should not be permitted to be discharged over shore cliffs but should be directed away from the face of the shore cliff or, where appropriate, piped to the base of the cliff.

In certain sections of the Lake Ontario shoreline, particularly within the Borough of Scarborough, existing development is subject to potential damage due to shoreline erosion. Protective measures are, therefore, required to protect lives and minimize loss of property and municipal servicing through the construction of suitable shoreline works. Shoreline protection will be carried out on the basis of technical priorities, the availability of funding and the accessibility of the site. Where protection is not feasible, acquisition by the Authority will be as outlined in the Land Acquisition Program.

The following criteria will guide the Authority in establishing priorities for the implementation of protective works:

- (a) The major emphasis in the undertaking of protective works will be to control erosion due to wave action. The

required works will be designed in consideration of maximum expected lake levels as well as peak storm conditions;

- (b) Consideration will be given to bank stabilization techniques to be combined with toe protection in areas where additional protection is required to retain slopes at steeper than natural angles;
- (c) Shore protection will be carried out on a design block basis. Design blocks are shoreline segments with physical characteristics which permit the segment to be protected as a unit. The characteristics to be considered include shoreline configuration, construction access, bank condition, talus formations and wave energy climate, among others;
- (d) Shoreline protection will be installed on a technical priority basis related to the safety of property and structures within the limitations of funding, approvals, construction access and property acquisition. Priorities shall be based on technical criteria including, but not necessarily limited to, the following:
 - distance from top of bank to structure
 - rate of slope retreat
 - extent of groundwater seepage
 - height and steepness of slope
 - soil composition
 - vegetative cover, type and extent
 - evidence of previous movement
 - condition of toe of slope;
- (e) Priorities for protection will be reviewed and approved by the Authority on an annual basis;
- (f) Existing waterfront public lands provide valuable recreational opportunities and, in many cases, serve as buffer zones between the shoreline and private lands. Therefore, the balance between funding allocated for protection of public and private lands is an important relationship which should be approved annually by the Authority;
- (g) In cases where private property is involved, the Authority shall require title to the land for a nominal sum or an easement where applicable, and in addition may require a suitable financial contribution from the benefiting owner(s);
- (h) The Authority will assist in developing technology and distributing information which will aid property owners in

limiting the erosion of the bank after the toe protection is installed;

- (i) The Authority's nursery will grow and sell plant material which is particularly well suited to bank stabilization and is not readily available from commercial suppliers. This part of the Program will be administered in accordance with the Conservation Land Management Program;
- (j) For the development and interim management of all waterfront area development, shoreline protection should be considered a part of the capital development cost. Following the transfer of waterfront areas to a municipality for management, the management of shore protective works should be funded within the Shoreline Management Program.

The funding of the Shoreline Management Program will be based on 55% from Provincial grants and 45% Authority funds, raised by a levy assigned to the benefiting municipality.

5.11 HERITAGE CONSERVATION PROGRAM

Heritage resources, where they occur on Authority lands, will continue to be conserved and managed as a community resource. The Authority has retained such resources, including structures and archaeological sites, on its lands at Claremont (farm dwelling), Bruce's Mill (mill and house), Black Creek (Black Creek Pioneer Village, both existing and relocated structures, and an archaeological site), Todmorden Mills, and Boyd (two archaeological sites). The Authority is aware that there are several known and unknown archaeological sites on its various properties which will be conserved under the terms of The Ontario Heritage Act, 1974. The major heritage resource project will continue to be Black Creek Pioneer Village.

5.11.1 Policy

It is the goal of the Authority's Heritage Conservation Program:

TO PROTECT THE HERITAGE CONSERVATION RESOURCES WHICH OCCUR ON ITS LANDS ACQUIRED UNDER THE LAND ACQUISITION PROGRAM WHERE SUCH RESOURCES ARE SHOWN TO BE OF REGIONAL SIGNIFICANCE OR PROTECTED BY THE ONTARIO HERITAGE ACT, 1974 AND TO RESTORE AND INTERPRET TO THE PUBLIC SELECTED HERITAGE CONSERVATION RESOURCES WHERE SUCH RESOURCES CONTRIBUTE TO A FULLER UNDERSTANDING OF THE HISTORICAL USE OF NATURAL RESOURCES.

In accomplishing this goal it is the objective of the Authority to:

- (a) continue to develop, manage and operate the Black Creek Pioneer Village as representing a pre-Confederation crossroads village demonstrating early central Ontario social, economic and political life and its relationship to resources;
- (b) continue to make the Black Creek Pioneer Village available as an educational resource to the school system;
- (c) develop a pricing policy and marketing strategy for Black Creek Pioneer Village that reflects the addition of major restorations;
- (d) cooperate with The Metropolitan Toronto and Region Conservation Foundation in developing suitable funding sources for a Visitors' Centre;
- (e) make the Black Creek valleylands south of Shoreham Drive available for municipal management subject to adequate provision being made for maintenance and supervision, and the right of access from Black Creek Pioneer Village to the Parsons Indian Village Site being retained;

- (f) continue to provide security for heritage resources and archaeological sites existing on Authority lands.

5.11.2 Program Description

In order to continue an economically viable operation at Black Creek Pioneer Village and to increase attendance, priorities for future development have been established. Of first importance is the phased construction of a Visitors Centre which would house dining, group assembly, gift shop and washroom facilities. This will be accompanied by the relocation of the service area to the southeast and the adding of the valley lands south of Shoreham Drive to the lands managed and developed under the Authority's management agreement with The Municipality of Metropolitan Toronto; the development and implementation of a marketing strategy; and the establishment of a pricing policy aimed at achieving a substantial proportion of operating costs being met through revenues. An annual grant from the Ontario Ministry of Culture and Recreation, under its Museum Grant Program, is available with the balance of funding derived through the municipal levy.

All capital development will be dependent upon the availability of funds, not only for construction, but also for any resultant staffing and building management requirements.

5.12 COMMUNITY RELATIONS PROGRAM

The Authority will continue to provide to its watershed community a comprehensive community relations program for conservation information and conservation education designed to communicate the role of the Authority in resource management, and to contribute to the understanding of the principles and practices of resource management so as to foster an appreciation of the need for conservation programs.

5.12.1 Policy

It is the goal of the Community Relations Program to:

COMMUNICATE TO ITS WATERSHED RESIDENTS THE GOALS AND OBJECTIVES OF THE AUTHORITY, TO REPORT THE ACCOMPLISHMENTS OF THE AUTHORITY PROGRAM, TO ENGENDER A POSITIVE ATTITUDE TOWARDS THE AUTHORITY AND TO INSPIRE AN AWARENESS AND APPRECIATION OF THE NATURAL RESOURCES WITHIN THE REGION AND THE NEED FOR THEIR MANAGEMENT AND CONSERVATION ON A WATERSHED BASIS.

In carrying out its responsibilities for outdoor and conservation education it will be the objective of the Authority to:

- (a) include opportunities for learning as an integral part of its conservation programs and facilities;
- (b) protect natural areas which are sensitive to use, and which have unique characteristics important for learning opportunities, through proper management practice, including use by regulation;
- (c) manage all lands, facilities and programs designated for outdoor and conservation education purposes in a manner consistent with the objects of the Authority, in order that participants can be assured of a continuing viable resource base;
- (d) consider the lands, projects and facilities of the Authority as the principal resources of the educational program, and provide suitable facilities to accommodate education users, including residential and day use accommodation, interpretive displays and demonstrations, visitor orientation facilities, trails and facilities for study and research;
- (e) cooperate with other resource management agencies and educational institutions in the provision of outdoor learning opportunities, where such use is compatible with

the programs of the Authority, and enter into agreements to give effect thereto;

- (f) cooperate with other resource management agencies and educational institutions in providing opportunities for study and research where such activity is compatible with the objects of the Authority;
- (g) carry out planning studies to determine the need to designate other tracts of land specifically for outdoor and conservation education purposes.

In carrying out its responsibilities for conservation information it will be the objective of the Authority to:

- (a) provide opportunities for Authority members and staff to become familiar with Authority policies, programs, administration, and operations, and recognize individual achievement and contributions to the work of the Authority;
- (b) provide information to members in order that they may better communicate with area and regional municipalities, school boards and the Province of Ontario;
- (c) develop specific programs to communicate to area and regional municipalities and school boards the need for work being carried out on their behalf by the Authority;
- (d) communicate to the residents of the Metropolitan Toronto region the vital need for resource management and the resource management programs being carried out by the Authority;
- (e) expand the communication of information concerning the Authority's water management responsibilities and the regulations and projects adopted to achieve these responsibilities;
- (f) maintain a flood forecasting and flood warning system for the purpose of alerting municipal representatives, media, police and other government agencies, as required;
- (g) develop new mechanisms for communicating technical information to specific audiences, particularly municipal/provincial staff and elected representatives and those involved in the development industry;
- (h) provide, at a fee where appropriate, technical information for use by municipalities and consultants in the design of

facilities impacting on authority water management responsibilities;

- (i) develop a comprehensive marketing strategy to communicate the facilities available in the Conservation Areas, Black Creek Pioneer Village and the Kortright Centre for Conservation;
- (j) provide print material, exhibits, and audio-visuals to attract visitors to Authority facilities;
- (k) cooperate with other agencies at the local, provincial or federal level, to market the Authority attractions both within and beyond the Metro Toronto region;
- (l) communicate, to public and private landowners, the value of practising conservation land management, and inform them of the availability of Authority demonstrations, advice and assistance.

5.12.2 Program Description - Conservation Education

The principle resources of the conservation education program are the lands acquired by the Authority to implement its resource management objectives. In particular, the conservation field centres at Albion Hills, Boyd, Claremont, Cold Creek and Lake St. George, and the Kortright Centre for Conservation will be the foci of the program.

The Authority will continue to operate its existing conservation education facilities and programs and will consider the addition of further facilities on the basis of requests from the participating Boards of Education. The development of these facilities would be based on school board requirements and funding, and on the compatibility of conservation education use with the Authority's other resource management objectives.

Funding for this Program is largely derived through user fees for facility visitation. Provincial grants of 50 or 55% are provided for certain components of the program with the remainder derived from a levy on the Authority's member municipalities.

5.12.3 Program Description - Conservation Information

The Authority will implement the conservation information program by evaluating and determining the most appropriate techniques to be utilized in transmitting specific information. This evaluation will reflect both the nature of the message to be communicated and the audience being addressed.

In order to stimulate attendance at the Authority's revenue-producing operations, a marketing area survey will be conducted as the first stage toward the development of a comprehensive marketing strategy to be implemented as part of this program.

Funding for the program will be based on a 50-55% Provincial grant with the remainder being raised by the Authority through a levy on its member municipalities.

5.13 DIRECTION

5.13.1 Interrelationship of Programs

The core of the Watershed Plan is the FLOOD CONTROL PROGRAM. The Authority recognizes that, given the physical characteristics of the watersheds under its jurisdiction and the patterns of urban development, provision for safety from the hazards of flooding and erosion is a basic requirement. The Flood Control Program provides for site specific remedial measures in damage centres, acquisition of flood plain land and the application of regulatory and planning measures to retain the capability of flood plains to pass flood flows unobstructed.

Accompanying the Flood Control Program are three programs which recognize the relationship between urban drainage, erosion and sedimentation, and flooding.

These programs contribute to the achievement of flood control objectives, and at the same time deal with erosion and sedimentation hazards. The EROSION AND SEDIMENT CONTROL PROGRAM is site specific and provides for corrective works where life and property is endangered. It also provides for regulatory and planning controls to prevent the development of additional hazard areas. The STORM WATER MANAGEMENT PROGRAM establishes a basis for cooperation between the Authority and its member municipalities in dealing with water management problems, at the source, through the preparation of master drainage plans. The Program will provide technical assistance by the Authority to municipalities. The CONSERVATION LAND MANAGEMENT PROGRAM recognizes that conservation practices, applied to individual parcels of land, both adjacent to or remote from watercourses, whether public or private, contribute to the reduction of flooding and erosion problems while at the same time enhancing the landscape. It provides for reforestation, habitat improvements, stream improvements, and a conservation land planning service to owners.

The Lake Ontario shoreline is treated in the same manner as a watershed in the SHORELINE MANAGEMENT PROGRAM which provides for the reduction of erosion and flooding hazards along the shoreline of Lake Ontario through the application of protective works, acquisition, and planning and regulatory controls.

The treatment of land in a watershed has a strong influence on the quantity and quality of water in its watercourses. To ensure proper conservation land management in many of the programs, the public acquisition of lands is a necessity. Public ownership of hazardous and sensitive lands, not only ensures that they are protected, but enables the application of necessary management practices. The LAND ACQUISITION PROGRAM establishes criteria for judging land suitable for acquisition and makes provision for the acquisition of flood plain and valley lands, waterfront lands, and environmentally significant lands.

Lands acquired for conservation purposes, in many cases, are capable of serving the community as open space and recreation resources. The WATERSHED RECREATION PROGRAM and the LAKE ONTARIO WATERFRONT DEVELOPMENT PROGRAM provide for the recreational development and management of Authority lands. Criteria for

judging suitable recreation uses are established and constraints, imposed by the physical characteristics of the land and water resources, are identified.

The HERITAGE CONSERVATION PROGRAM recognizes the special contribution that an historical perspective gives to the understanding of resource management.

All of the efforts of the Authority in its conservation programs are dependent upon community understanding and acceptance. The COMMUNITY RELATIONS PROGRAM establishes the means by which the Authority can communicate with the community, and places a special emphasis on legislators, municipal councillors, media, and the school system.

Figure 4 illustrates, in plan form, the application of the programs on the watersheds under the Authority's jurisdiction.

5.13.2 Costs and Financial Implications

The Watershed Plan identifies the direction which resource management will take in the Metropolitan Region over the next several years. It recognizes that there have been 25 years of effort preceding the Plan and, that during this time, substantial progress has been made.

Land acquisition, in combination with major structural works, storage reservoirs and channels, and the application of regulations, has given relief to most of the major damage centres which were affected during Hurricane Hazel. The Plan concluded that the effort in the future should be directed to the prevention of new flood problems and to dealing with the remaining flood damage centres by means of cost effective, site specific remedial works. This approach necessitates a major shift in costs from capital intensive land acquisition and structures to development control, planning, regulatory, flood warning and land management costs. The overall impact of this shift is that the Authority's efforts, in terms of staff time allocation for flood control and related measures, will be increased and intensified, but spending will be decreased.

The Plan identifies that the Programs which directly contribute to the alleviation of flooding: Flood Control, Storm Water Management, Land Acquisition and Conservation Land Management, provide for work to proceed at a pace which is manageable within Authority capacity, and will require 21.4% of annual funding allocations.

The role of the Authority in erosion and sediment control measures has increased over the years. A vigorous erosion control program, initiated in Metropolitan Toronto in the early 1970's has dealt with many serious and costly valley erosion problems. Most of the major sites have now been dealt with, and although the inventory of sites requiring works remains lengthy, the cost of remedial works, site by site, is more modest. The program has been expanded to include all member municipalities, and the opportunity to carry out 'stitch in time' works has been afforded. Only a very modest start in dealing with the substantial erosion problems along the Lake Ontario shoreline has been made. The funding allocation recommended in the Watershed Plan for erosion and sediment control works recognizes these factors and provides for more emphasis

on the Lake Ontario shoreline. The Plan allocates 11.8% of the annual funding to Erosion and Sediment Control and Lake Ontario Shoreline Management.

Considerable study was given to the management of Authority lands for recreation purposes. The total land holdings of the Authority at mid year 1980 were 10,646 hectares. The management cost of this land is a major concern. The Plan recommends that the practice of encouraging municipalities to manage conservation lands in urban areas be continued, that the recreational use managed by the Authority be confined to eight conservation areas, and that the remaining lands be managed as forest and wildlife areas and resource management units. The cost of managing the Watershed Recreation Program represents 5.3% of total funding for program administration and development, 4.8% of total funding for municipal levy to support operations and maintenance, and 6.4% of total funding which represents conservation area revenues which contributes to operations and maintenance. The relatively low allocation of provincial and municipal funds for the Watershed Recreation Program reflects the advanced stages of development of most conservation areas and the substantial portion of maintenance and operating costs which are met through program revenues.

Lake Ontario Waterfront Development is presently classified as a special project by the Province of Ontario and does not impact on provincial cash flow available for Water and Related Land Use, Conservation and Recreation, and Administration. It does, however, impact on available municipal funds. The nature of the waterfront work is such that once a component is started, substantial funding is required to complete it. The funding allocation in the Plan for Lake Ontario Waterfront Development is 25% less than the provision in the original Waterfront Project, but still will provide for reasonable progress. It represents 20% of the total funding allocation.

The Heritage Conservation Program represents 7.6% of the total funding allocation. The municipal levy portion represents .4% of the total funding allocation, the remainder being revenues applicable to the operation of Black Creek Pioneer Village. There is no provision in the Plan for major new development. The construction of a Visitors Centre is an objective but funding would be over and above annual allocations and derived from a variety of sources.

The Community Relations Program contributes to all the other programs, through information services and specific learning opportunities and represents 12.6% of the total funding allocation. Included in this allocation is 6.6% derived from program revenues. The allocation for this Program was determined on the basis of maintaining existing level of service and modestly increasing the Authority's ability to continue the development of educational facilities.

All funding allocations for the Programs include an allowance for direct program administration costs, including supervision and employee benefits.

Overall Authority administration costs include all administrative office management and support costs and represent 10% of the total funding allocation.

In summary, the Plan recommends an annual funding allocation expressed in 1980 dollars as follows:

	<u>\$MILLION</u>		PROV/MUNC	% OF FUNDING
	<u>EXPENDITURES</u>	<u>REVENUES</u>	<u>FUNDING REQUIRED</u>	
. Programs directly related to				
Flood Control	3.2		3.2	26.5
. Erosion & Sediment and				
Shoreline Management	1.8		1.8	14.9
. Watershed Recreation	2.7	1.0	1.7	14.0
. Lake Ontario Waterfront	3.0		3.0	24.8
. Heritage Conservation	1.0	.9	.1	.8
. Community Relations	1.9	1.0	.9	7.4
. Administration	<u>1.4</u>	<u> </u>	<u>1.4</u>	<u>11.6</u>
TOTAL	15.0	2.9	12.1	100.0

The impact of new capital development on the annual operations and maintenance costs of the Authority is set out in the programs. As new land is acquired or as new remedial measures are constructed, the addition of management costs will be reflected in the budget of subsequent years.

5.13.3 Priorities

The Watershed Plan has been prepared as a comprehensive guide for the Authority in carrying out its conservation mandate and in compliance with the direction from the Province of Ontario that an authority file, with the Province and its member municipalities, a Watershed Plan. The Plan consists of ten conservation programs which are seen as being complementary to one another in achieving the Authority's overall goal. Within each of the Programs there are priorities for the various activities which make up the Program. The setting of priorities is necessary in order that limited time and financial resources can be allocated to have the greatest impact on achieving the goal. All of the Programs contribute to the goal and are considered of equal priority. The annual funding which is allocated to each Program is not an indicator of its priority but a measure of what is required to achieve the goal of that Program.

Based on the Programs outlined in this Plan, the Authority will, as in the past, adopt projects for the carrying out of its work. It is the policy of the Authority, in this regard to:

(a) adopt a project;

(b) request the approval of the municipality(ies);

- (d) request the approval of the Ontario Municipal Board if it is to be a multi-year project or if a municipality is going to capitalize its share;
- (e) upon receipt of all approvals, levy the municipalities for their share. This can be done either as a part of the annual budget or as a special levy, if agreed to by the municipalities.

6. GLOSSARY OF TERMS

The following definitions are provided to facilitate understanding of the Watershed Plan and its component Programs. Many of the definitions are derived from the "Resource Conservation Glossary" published by the Soil Conservation Society of America.

accretion: the gradual addition of new land to old by the deposition of sediment carried by a stream

alluvial: pertaining to material that is transported and deposited by running water

antecedent soil moisture: degree of wetness of soil prior to the beginning of a runoff period, expressed as an index or as total inches of soil water (moisture)

aquifer: a geologic formation of structure that transmits water

arboretum: a collection of plants, trees and shrubs grown for public exhibition; for public enjoyment, recreation, education or research

armouring: material used or method of stabilizing areas to protect from erosion

backwater: water moved or held back

backwater calculation: the calculation of flood levels taking into account the volume of water (flows) and the channel geometry; including man-made structures or restrictions, ie. bridges, culverts

base flow: stream discharge from groundwater runoff

basin: in hydrology, the area drained by a river

benthos: the plant and animal life whose habitat is the bottom of a sea, lake or river

berm: a shelf or flat area that breaks the continuity of a slope; dyke

biophysical: the combination of biological and physical characteristics

biota: the flora and fauna of a region

boat launch: man-made device for launching watercraft eg. ramp structure where a boat trailer may be backed into the water to a depth sufficient to float the boat

buffer: strips of erosion-resisting vegetation; land used to separate conflicting uses

catchbasin: area draining into a reservoir; river basin; device to catch drainage

channel: a natural stream that conveys water; a ditch or channel excavated for the flow of water

channel improvement: the improvement of the flow characteristics of a channel by clearing, excavation, realignment, lining, or other means, in order to increase its capacity

confluence: point where streams come together

conservation: the protection, improvement and use of natural resources according to principles that will assure their highest economic or social benefits

conservation ethic: a philosophy of conduct and principles practiced to achieve the optimum combination of resource utilization and resource protection to meet the objectives of the community.

conservation lands: lands which are considered to be regionally significant, such as valleys, or environmentally sensitive and are best managed by a public agency to retain their natural characteristics

continental climate: the type of climate characteristic of areas separated from the moderating influence of oceans by distance, direction or mountain barriers; marked by relatively large daily and seasonal change in temperature

cross-section: a vertical section of the river valley perpendicular to the stream or river which illustrates the shape of the valley and river channel. Used to determine the opening available for the passage of flood flows

cut-and-fill: process of earth moving by excavating part of an area and using the excavated material for adjacent embankments or fill areas

damage centre: an existing developed area that is susceptible to loss of life and/or property damage as a result of flooding up to the Regional Flood event. However, due to excessive acquisition costs or the possible disruptive nature of acquiring existing viable developed areas (damage centres), continued development or redevelopment (infilling) may be possible subject to conditions established by the Authority

dike: in engineering, an embankment to confine or control water, especially one built along the banks of a river to prevent overflow of lowlands

dredgeate: dredged material

drumlin: smoothly rounded, oval hill formed under moving glacial ice

easement: a limited right over land owned by someone else

ecology: the study of interrelationships of organisms to one another and to their environment

environment: the sum total of all the external conditions that may act upon an organism or community to influence its development or existence

erosion: 1. the wearing away of the land surface by running water, wind, ice or other geological agents.
2. detachment and movement of soil or rock fragments by water, wind, ice or gravity. The following terms are used to describe different types of water erosion:

accelerated erosion: erosion much more rapid than normal, natural or geologic erosion, primarily as a result of the influence of the activities of man or, in some cases, of other animals or natural catastrophies that expose base surfaces, for example, fires

gully erosion: the erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet

natural erosion: wearing away of the earth's surface by water, ice, or other natural agents under natural environmental conditions of climate, vegetation, etc., undisturbed by man. Also called geological erosion

rill erosion: an erosion process in which numerous small channels only several inches deep are formed; occurs mainly on recently disturbed

sheet erosion: the removal of a fairly uniform layer of soil from the land surface by runoff water

escarpment: a steep face or a ridge of high land

esker: a narrow ridge of gravelly or sandy drift deposited by a stream in association with glacial ice

fair market value: that value that would induce a willing seller to sell and a willing buyer to buy

fill: any material deposited by any agent so as to fill or partly fill a channel, valley, or other depression

fill regulation: the regulation of the placing of fill by the Authority through the requirement of a proponent to obtain permission as set out under Section 27(1) of The Conservation Authorities Act

fill regulation line: used to establish the area wherein the Authority will regulate the placing of fill

flood: an overflow or inundation that comes from a river or body of water and causes or threatens damage

flood damage reduction measures: any combination of structural and nonstructural additions, change or adjustments to existing flood vulnerable structures which reduce or eliminate flood damage to real estate or improved real property, water and sanitary facilities, structures and their contents

flood event: an occurrence based upon the measurement or calculation of the volume of runoff or peak flow that results from any given rainfall or snowmelt. It should be noted, for example, that a 15 year storm event

does not necessarily produce a 15 year flood event. The following are examples of flood events:

100 Yr. Flood (valleys): the flood that based on historical data occurs on the average once in 100 years. It is based on peak flows as opposed to rainfall amounts

1:100 Yr. Flood (waterfront): the flood that based on historical data occurs on the average once in 100 years. For the waterfront, the 1:100 year flood is utilized as the Regional Flood

Regional Flood: the flood elevation that is produced by the runoff that results from rainfall as defined by the Regional Storm. The Regional Flood for the waterfront is the flood elevation produced by the Regional Storm for the waterfront

flood peak: the highest value of the stage or discharge attained by a flood

floodplain: nearly level land situated on either side of a channel which is subject to overflow flooding

floodway: an area used to carry excessive flood flows. The transitional area between the active channel and the floodplain

flow depth: the depth of the water at any particular location within the floodplain or channel

flow velocity: the speed of flowing water. This will vary depending on where within the floodplain or channel the velocity is measured. Generally, flow velocities are greatest within the central portion of the channel and decrease to the edge of the floodplain

free board: is the distance between the top of any berm, dike, dam or edge of a no development zone and the design level, i.e. the maximum water surface elevation anticipated in design

frequency (return period): a statistical indication of the rate at which a specific event occurs over a given period of time. For example a 1 in 10 year flood would occur on the average once every 10 years. However, it should be noted that it is possible to experience more than one 100 year flood within a 100 year period

gabion: a rectangular or cylindrical wire mesh cage filled with rock and used in protecting against erosion

geomorphology: the study of the form of the earth, the general configuration of its surface, and the changes that take place in the evolution of landforms

grade: 1. the slope of a road, channel or natural ground. 2. the finished surface of a canal bed, roadbed, top of embankment, or bottom of excavation; any surface prepared for the support of construction. 3. to finish the surface of a canal bed, roadbed, top of embankment, or bottom of excavation

gradient: change of elevation, velocity, pressure or other characteristics per unit length; slope

grassed waterway: a natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water

groundwater: subsurface water in the zone of saturation

groynes: beach protection structure perpendicular to shoreline

habitat: the environment in which the life needs of a plant or animal organism, population, or community are supplied

hazard lands: those lands which due to their susceptibility to flooding or unstable slopes or soils are considered to be hazardous if developed

headwater: 1. the source of a stream. 2. the water upstream from a structure or point on a stream

hydraulics: the science that enables the calculation of flow depths and velocities and how they are affected by channel and valley geometry as well as various obstructions such as bridges, culverts, etc.

hydrologic cycle: the circuit of water movement from the atmosphere to the earth and return to the atmosphere through various stages or processes, as precipitation, interception, runoff, infiltration, percolation, storage, evaporation, and transpiration

hydrology: the science dealing with the waters of the earth or what happens to the rain once it falls on the ground. Calculations of the volume (flows) of water for various storm events at various locations on the watershed can be made

hydrostatic pressure: the force per unit area exerted by a liquid at rest

impervious/impermeable soil: a soil through which water, air or roots cannot penetrate

infilling: development or redevelopment within a damage centre

infiltration: gradual downward flow of water from the surface through soil to groundwater and water table reservoirs

intermittent stream: a stream or portion of a stream that flows only in direct response to precipitation and is dry for a large part of the year

kame: a conical hill or short irregular ridge of sand or gravel deposited in contact with glacial ice

landform: a discernible natural landscape, such as a floodplain, stream terrace, plateau, or valley

marsh: a periodically wet or continually flooded area where the surface is not deeply submerged; covered dominately with sedges, cattails, rushes, or other hydrophytic plants

meander: the turn of a stream

microclimate: the climatic condition of a small area resulting from the modification of the general climatic conditions

moraine: an accumulation of glacial drift, generally of rock, gravels and sands, built within a glaciated region chiefly by the direct action of glacial ice

nonpoint pollution: pollution whose sources cannot be pinpointed

open space: a relatively undeveloped green or wooded area, generally referred to in an urban development

outdoor recreation: the use of soil, water, and natural resources, their aesthetic values and productivity, in accordance with the suitability of these resources for providing outdoor leisure-time activities

outfall: point where water flows from a conduit, stream or drain

permeable/pervious: capable of transmitting air or liquid

physiography: study of the earth's surface and oceans, atmosphere, etc.

point source (pollution): a stationary source which can be identified

probability: another way of defining the frequency of an event. The probability of a 1 in 10 yr. flood is 1/10 or 0.1. A 1:10 yr. flood event has a statistical probability of 0.1 of being equalled or exceeded once in 10 years. It can also be said that there is a 10% chance of the 10 yr. flood occurring in any one year

rainfall intensity: the rate at which rain is falling at any given instant

recharge: process by which water is added to the zone of saturation, as recharge of an aquifer

reforestation: restocking an area with forest trees

regional storm: the storm used for regulation purposes as defined by the Authority.

The Metropolitan Toronto and Region Conservation Authority has defined the Regional Storm for the valleys as that storm which is based on the rainfall that fell during Hurricane Hazel.

The Regional Storm utilized for the waterfront is that combination of high water, wind set up and wave uprush that produces the Regional Flood. The Regional Storm for the

waterfront is based on a 1:100 year event.

renewable natural resources: resources that can be restored and improved

reservoir: impounded body of water or controlled lake in which water is collected or stored

revetment: facing of stone or other material, either permanent or temporary, placed along the edge of a stream or shore to stabilize the bank and to protect it from erosion

riprap: broken rocks, cobbles or boulders placed on earth surfaces for protection against the action of water (waves)

risk: the chance that is associated with any action where harm or loss can be encountered. The risk associated with building in the floodplain can be assigned a percentage value based upon the degree of flood susceptibility of the proposed development. For example, there is a 39% risk that a development within the 100 year floodline would be damaged over a 50 year period

runoff: that portion of the precipitation on a drainage area that is discharged from the area in stream channels

sediment: solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity or ice and has come to rest on the earth's surface either above or below sea level

seiche: short term changes in the water level of a lake due to changes in barometric pressure or other factors

slope: the degree of deviation of a surface from horizontal, measured in a numerical ratio, percent or degrees

spill zone: an area where the valley is ill defined resulting in a broad, uncontained exit for flood waters. As a result, it is difficult to accurately determine the limit or depth of flooding

stage: the variable water surface or the water surface elevation above any chosen datum

stereoscope: a binocular optical instrument for viewing two properly oriented photographs to obtain a mental impression of a three dimensional effect

storm event: a rainfall event where the amount of rain that falls is measured as opposed to the volume of runoff. Two storms referred to are:

1:100 yr. storm (valleys): the storm that produces an amount of rainfall that based on historical data occurs on the average once in 100 years

1:100 yr. storm (waterfront): the storm that produces a combination of high lake levels, wind set up and wave uprush that based on historical data occurs on the average once in 100 years

stream, cold water: a stream that supports a cold water fishery, usually including trout. Optimum temperatures are 10 degrees C to 15 degrees C

substrate: 1. the base of substance upon which an organism is growing.
2. the bottom material of a waterway

succession: the progressive development of vegetation toward its highest ecological expression, the climax; replacement of one plant community by another

swamp: an area saturated with water throughout much of the year but with the surface of soil not deeply submerged; usually characterized by tree or shrub vegetation

till: unstratified glacial drift deposited directly by the ice and consisting of clay, sand, gravel, and boulders intermingled in any proportion

topography: the relative positions and elevations of the natural or manmade features of an area that describe the configuration of its surface

two zone concept: used to describe a type of floodplain management which allows a certain encroachment into the floodplain by filling to a point where the increase in flood levels upstream does not exceed a specified amount

urban runoff: storm water from city streets and gutters that usually contains a great deal of litter and organic and bacterial wastes

water resources: the supply of groundwater and surface water in a given area

watershed area: all land and water within the confines of a drainage divide

watershed management: use, regulation, and treatment of water and land resources in a watershed to accomplish stated objectives

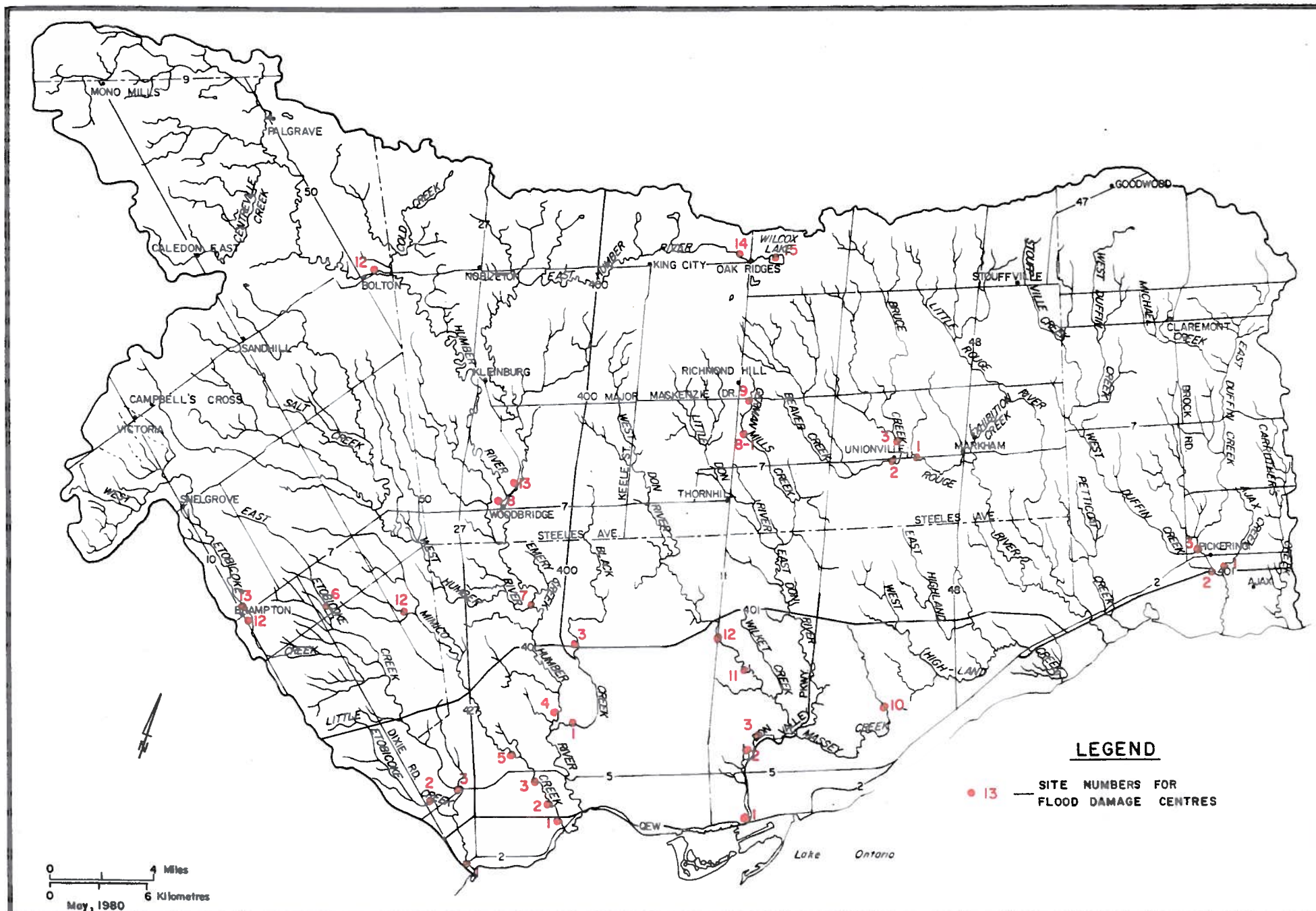
watershed planning: formulation of a plan to use and treat water and land resources

weir: device for measuring or regulating the flow of water

APPENDIX

Selected Program Graphics

The following graphics have been selected from the ten programs of the Watershed Plan and are included in this document for information. For complete details the program documents should be referred to.

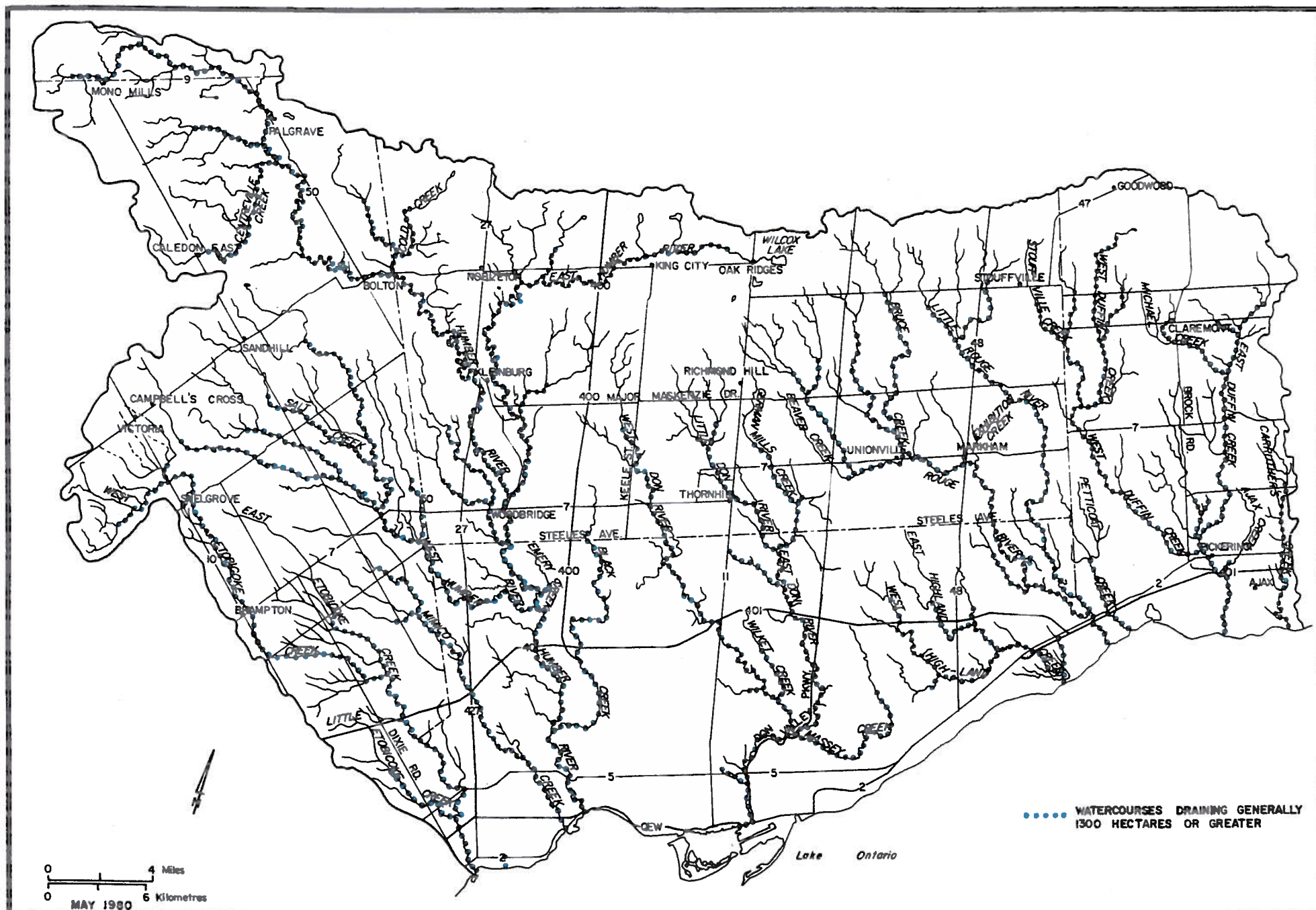


the metropolitan toronto and region
conservation authority

WATERSHED PLAN
FLOOD CONTROL PROGRAM

FLOOD DAMAGE CENTRES

FIG. A-2

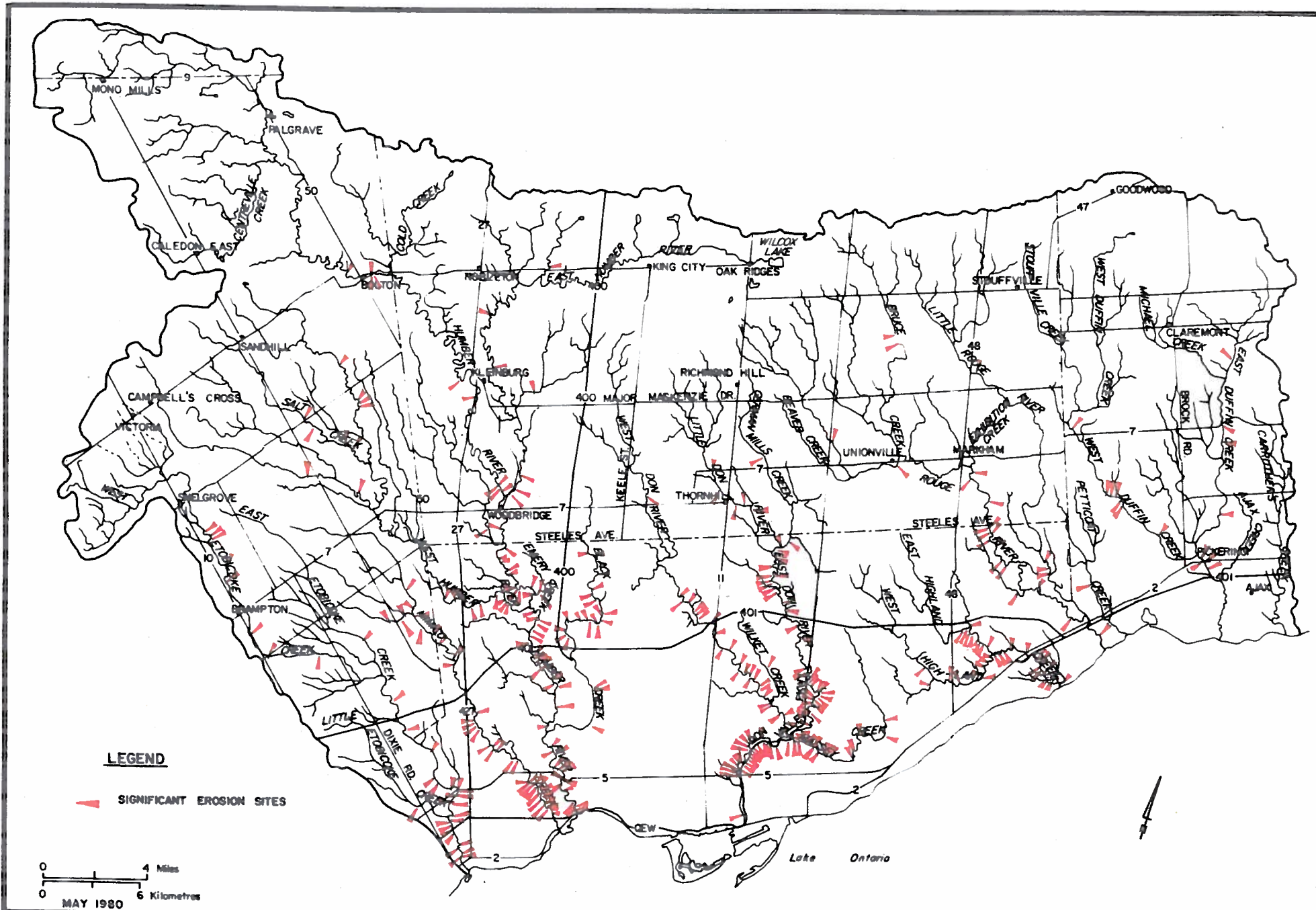


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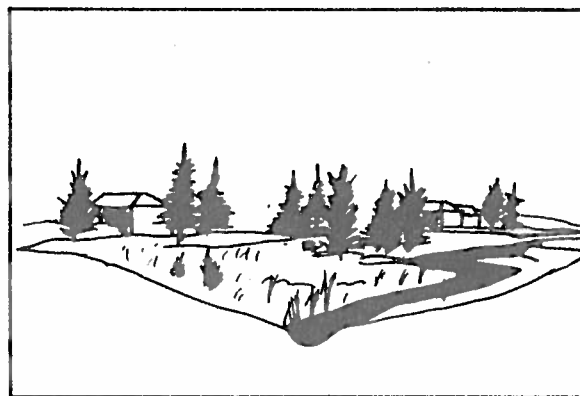
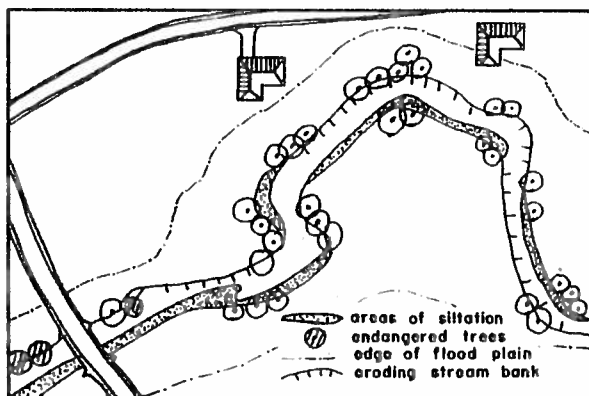
WATERSHED PLAN **EROSION AND SEDIMENT CONTROL PROGRAM**

WATERCOURSES DRAINING GENERALLY
1300 HECTARES OR GREATER

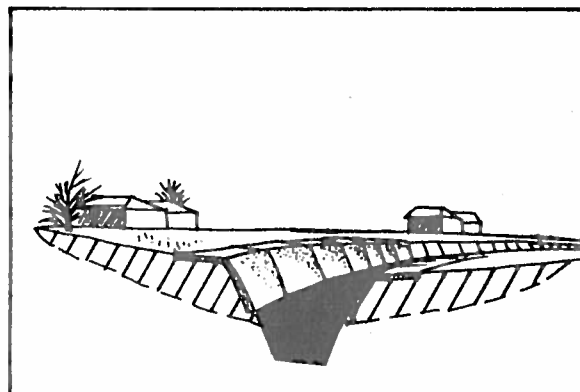
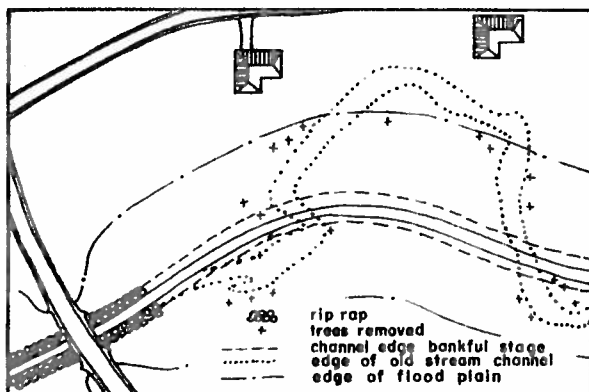
FIG. 9



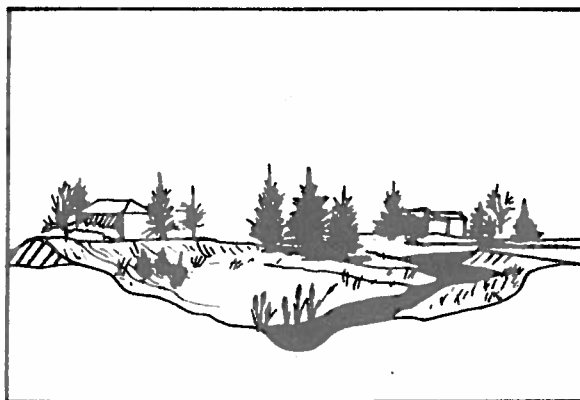
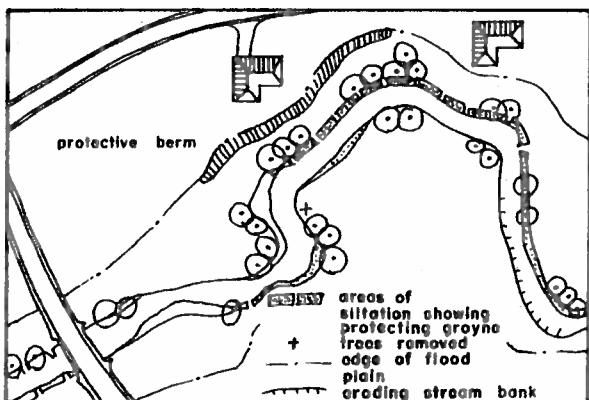
ENCROACHING URBANIZATION ON A
NATURAL STREAM CHANNEL



CONVENTIONAL FLOOD PREVENTION MEASURES



CONTEMPORARY FLOOD PREVENTION ALTERNATIVES USING
CONVIVIAL TECHNOLOGY AS A PART OF A COMPREHENSIVE
STORM WATER MANAGEMENT PROGRAM

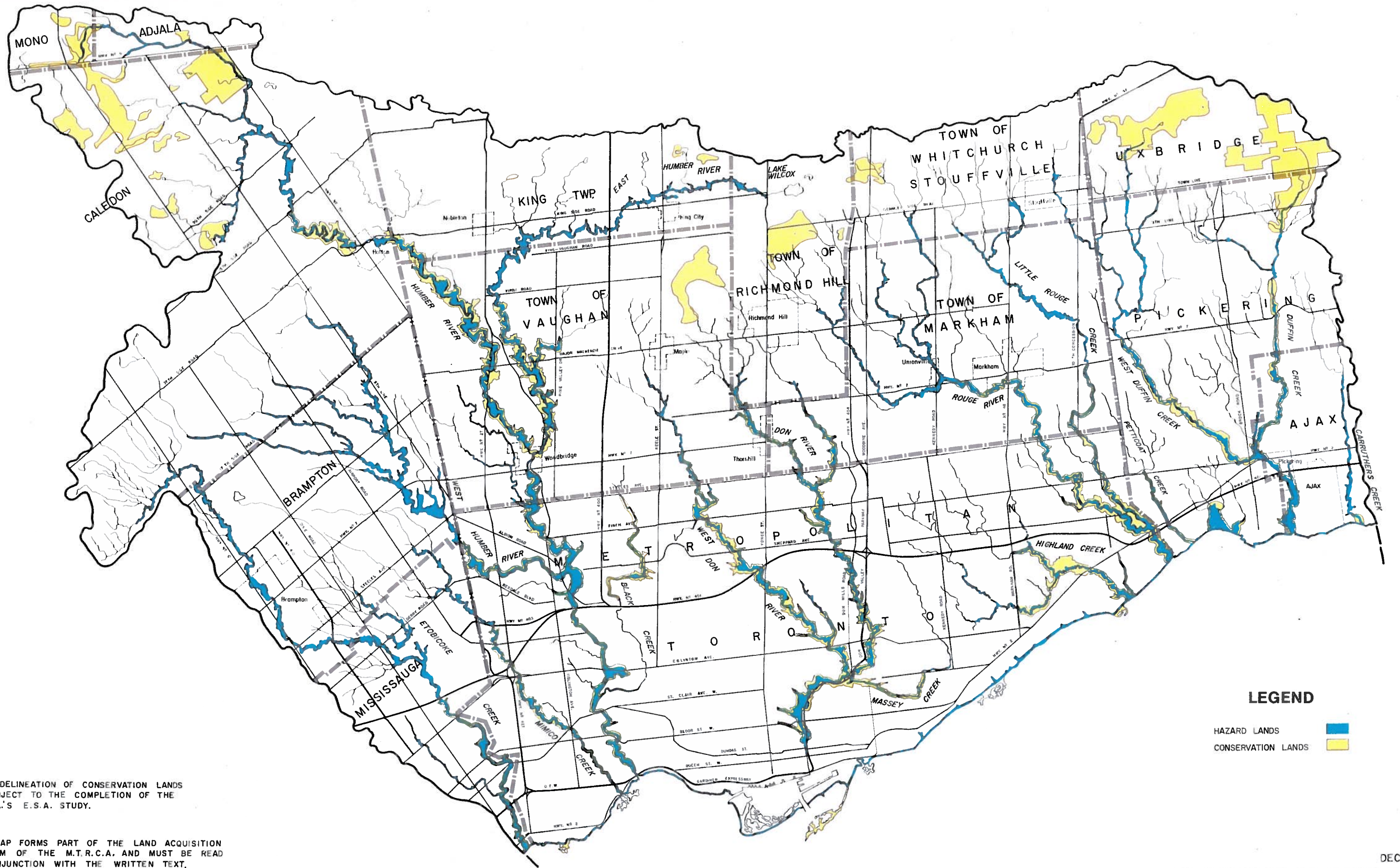


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conservation authority

WATERSHED PLAN
STORMWATER MANAGEMENT PROGRAM

**NATURAL DRAINAGE
DESIGN CONCEPTS**

FIG. 10



FINAL DELINEATION OF CONSERVATION LANDS
IS SUBJECT TO THE COMPLETION OF THE
M.T.R.C.A.'S E.S.A. STUDY.

THIS MAP FORMS PART OF THE LAND ACQUISITION
PROGRAM OF THE M.T.R.C.A. AND MUST BE READ
IN CONJUNCTION WITH THE WRITTEN TEXT.

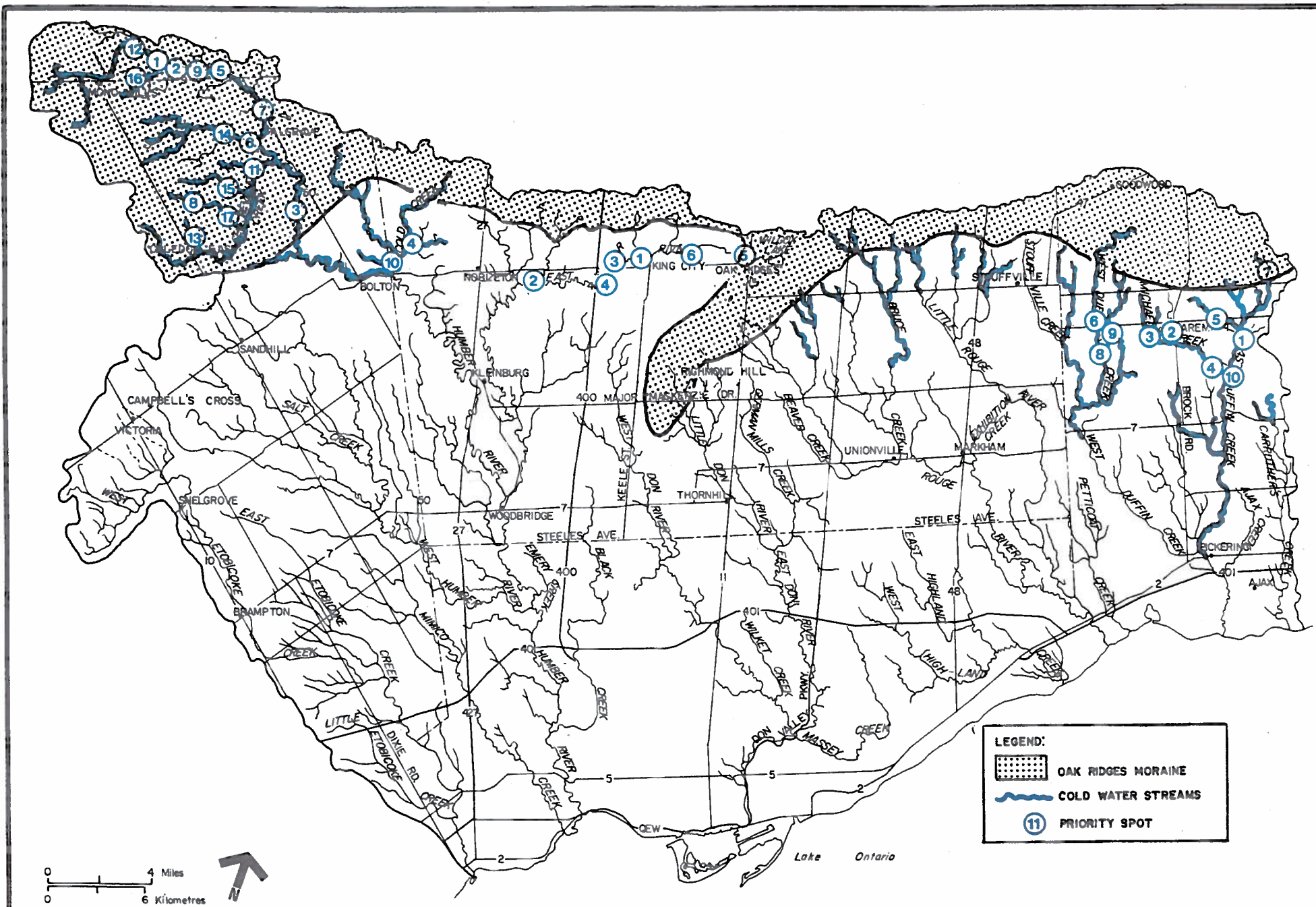
LEGEND

HAZARD LANDS
CONSERVATION LANDS



DEC. 1980



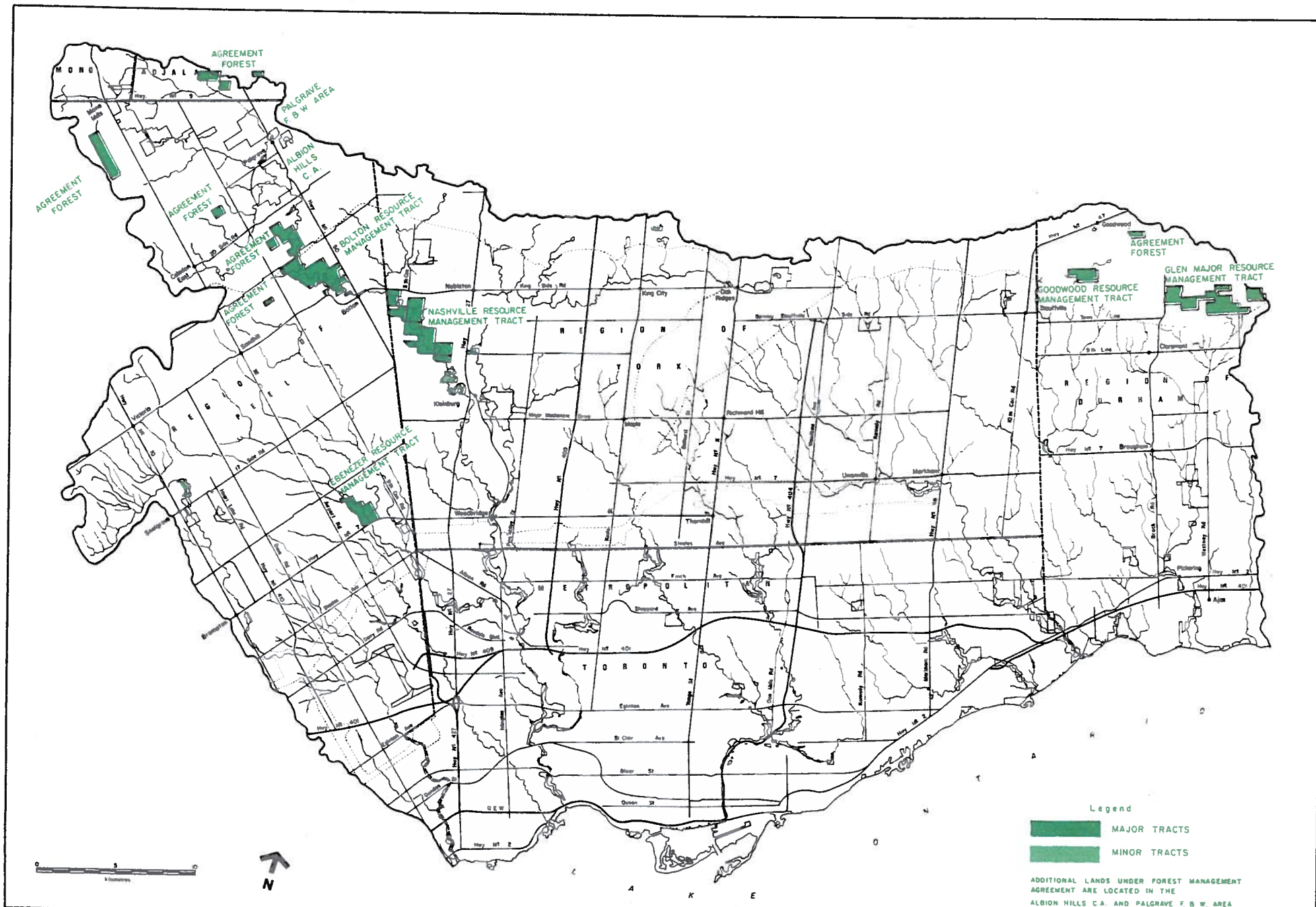


the metropolitan toronto and region
conservation authority

WATERSHED PLAN **CONSERVATION LAND** **MANAGEMENT PROGRAM**

EXTENT OF THE COLD WATER
FISHERIES POTENTIAL WITHIN THE
METROPOLITAN TORONTO REGION

FIG. 8

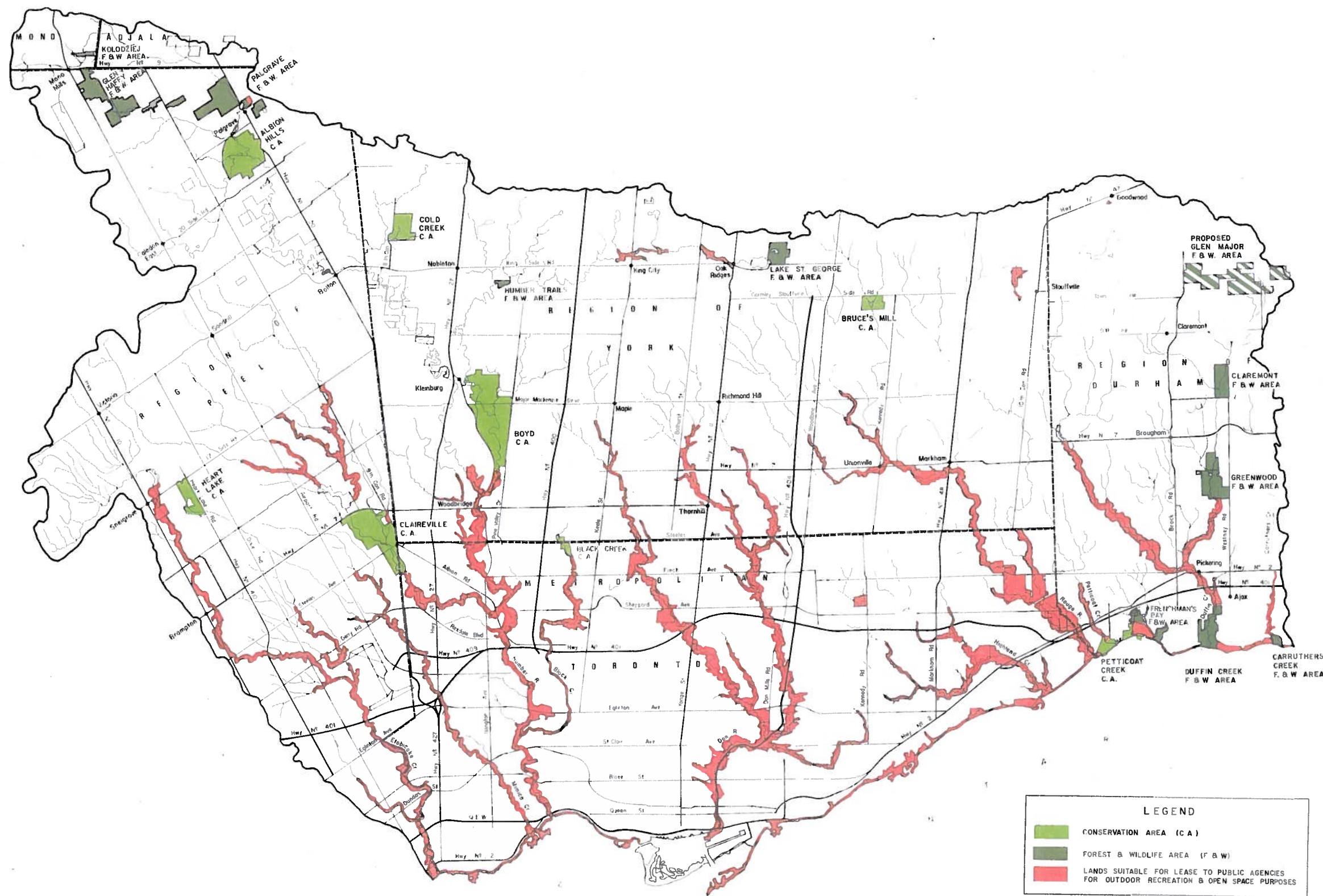


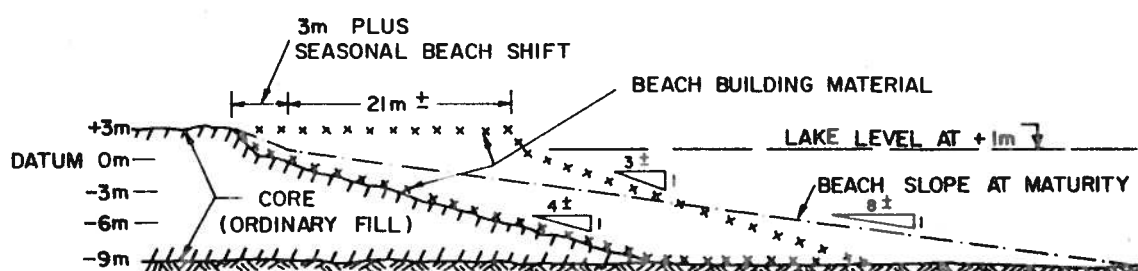
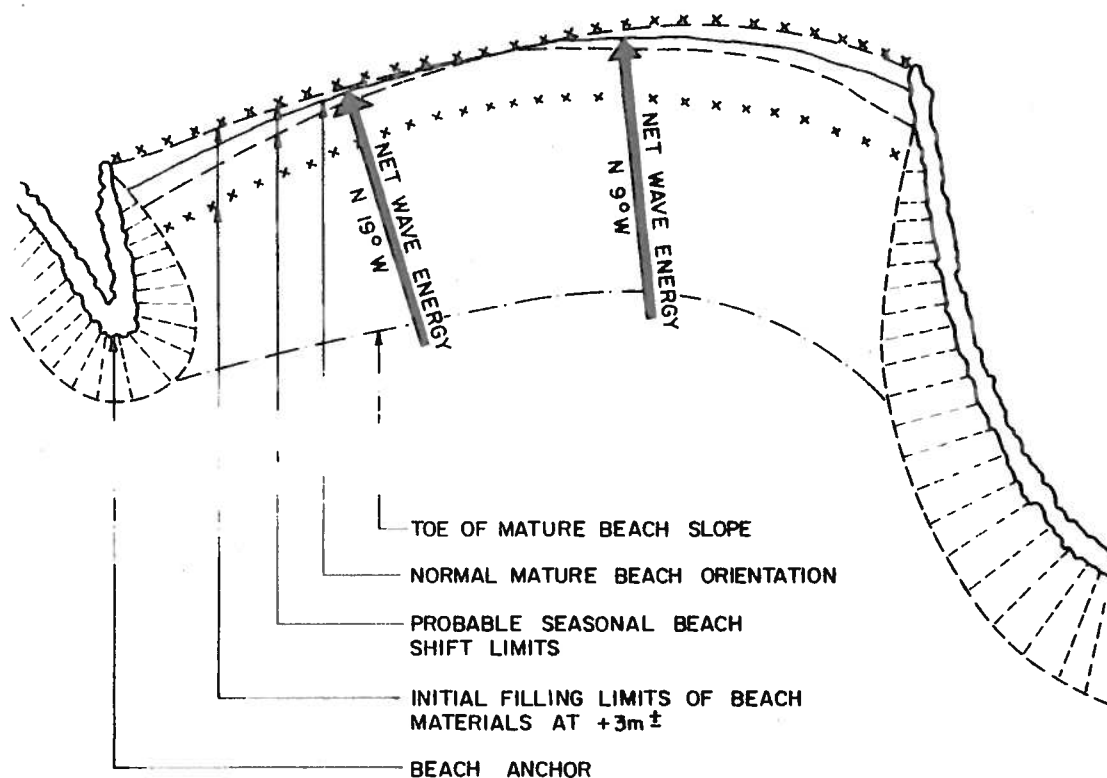
the metropolitan toronto and region
conservation authority

WATERSHED PLAN CONSERVATION LAND MANAGEMENT PROGRAM

AUTHORITY
RESOURCE MANAGEMENT
TRACTS

FIG. 9





TYPICAL PROFILE

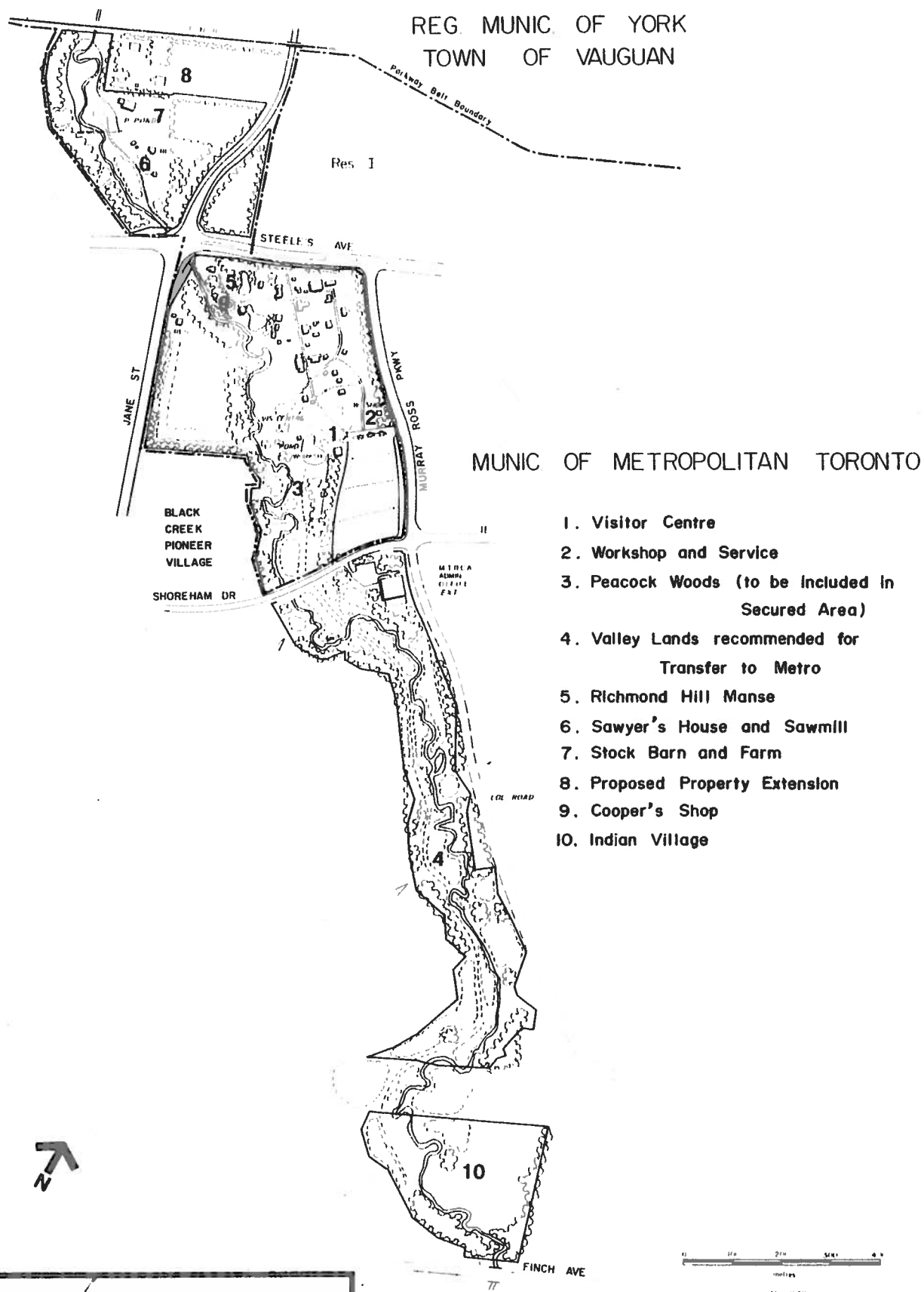


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conservation authority

WATERSHED PLAN
SHORELINE MANAGEMENT PROGRAM

BASIC DESIGN FEATURES OF
AN ANCHORED BEACH

FIG. 7



the metropolitan toronto and region
conservation authority

WATERSHED PLAN
HERITAGE CONSERVATION PROGRAM

MASTER PLAN
BLACK CREEK PIONEER VILLAGE

FIG. 2



Albion Hills Conservation Field Centre



Claremont Conservation Field Centre



Boyd Conservation Field Centre



Lake St. George Conservation Field Centre

