G U I D E L I N E S

F O R

ENVIRONMENTAL APPRAISAL UNDER THE DRAINAGE ACT, 1975

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SUBMITTED BY A JOINT COMMITTEE OF

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Ontario Ministry of the Environment
Ontario Ministry of Natural Resources

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GUIDELINES FOR ENVIRONMENTAL APPRAISAL UNDER THE DRAINAGE ACT, 1975

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PART I: INTRODUCTION

Under Section 6, Subsection 1 of The Drainage Act, 1975, the local municipality, Conservation Authority, or the Minister of Natural Resources where no authority exists, may request that an Environmental Appraisal be undertaken on a drainage works, constructed or maintained under the Act. This request must be made within 30 days of receiving the notice from the initiating municipality.

The Drainage Act does not specify what an Environmental Appraisal should contain. To assist drainage practitioners and others in the understanding of the purpose, procedure and contents of an Environmental Appraisal document, guidelines have been prepared by a committee composed of representatives of the Ministry of Agriculture and Food, Ministry of the Environment, and Ministry of Natural Resources. These guidelines indicate the type of information required to identify environmental effects of a drainage project, and to propose courses of action to maximize benefits and minimize adverse effects, For specific projects some criteria outlined in the guidelines may not be relevant, while other information and considerations may be necessary. For each particular drainage project more specific advice on the type of information which should be contained in an environmental appraisal can be gained through discussion with the Food Land Development Branch of the Ministry of Agriculture and Food in Toronto.

Purpose

The purpose of an Environmental Appraisal is to:

1. Ensure that the physical, social and economic environment is adequately taken into account during the design stage.

2. Ensure sound design, construction and operation of outlet drainage projects.

3. Identify and evaluate the potential benefits and disbenefits of a drainage project on the total environment, at a stage when the design of the drain is still flexible.

Definition of Environment

For purposes of an Environmental Appraisal under The Drainage Act, 1975, environment will refer to the physical environment, both natural (biotic) and man-made (abiotic), and includes social, cultural and economic factors.

Procedures

Under Section 4 of the Drainage Act, 1975, drainage work for an area requiring construction of a new drain is initiated by a petition from landowners.* In the case of improvement, maintenance or repair to an existing drain, initiation of a project is by notice from an affected land owner. Upon receipt of the petition or notice, the initiating municipality notifies (a) the Conservation Authority having jurisdiction over the affected land, or the Ministry of Natural Resources where there is no Conservation Authority, and (b) the councils of any municipalities that might be affected by the drain. Following this notification, the Conservation Authority (or Minister of Natural Resources, where no Authority exists) and the councils of any municipalities that might be affected "may send to the council of the initiation municipality within thirty (30) days, a notice that an environmental appraisal of the effects of the drainage works on the area is required, and the cost thereof shall be paid by the party who requested it" (Section 6(1) of the Drainage Act, 1975). The initiating municipality may also obtain an environmental appraisal on its own initiative, the cost of which will be paid by the municipality. It is only these parties that can request that an Environmental Appraisal be undertaken. As outlined in Section 10 of the Act, the Environmental Appraisal, if requested, is to be submitted as part of the Engineers preliminary report.

*For details regarding the form the petition should take, and for more specific information on the implementation of the Act, refer directly to the Drainage Act, 1975.

The environmental appraisal is a two step procedure: the initial phase being a screening process, and the second phase being a more comprehensive environmental study. The purpose of Phase 1 is to provide general information to determine the environmental effects of the proposed project. If significant effects are identified, Phase 2 would be required to identify in more detail the potential effects, and to determine a design which would maximize benefits and mitigate adverse effects from the project.

The two step process was adopted to reduce any unnecessary Environmental Appraisal Report costs and to expedite the proceedings of the drainage work. As the Environmental Appraisal must be requested within thirty (30) days after receipt of the notice from the initiating municipality, the request often will be based on relatively little information. Phase 1 of the Appraisal will allow an informed prediction of whether the project is likely to have significant environmental effects. If it is found during Phase 1 that the project is unlikely to have detrimental effects, the environmental appraisal could be discontinued. However, if Phase 1 identifies potentially detrimental effects, Phase 2 should be undertaken.

If an Environmental Appraisal is requested, the engineer following determination of the validity of the petition (Section 9), must prepare the Phase 1 document, or arrange to have it prepared. After its completion, it is submitted to the agency requesting the appraisal which then decides promptly if the Environmental Appraisal should be continued. If continuation of the Appraisal is chosen, the engineer proceeds accordingly with Phase 2, submitting both Phases 1 and 2 along with his preliminary report.

Once the preliminary report is filed with the council, all affected persons are to be notified of a meeting to consider this report. Withdrawal from or addition to the petition at the meeting is possible. If at the end of the meeting, the petition does not contain sufficient signatures, the costs incurred (except the costs

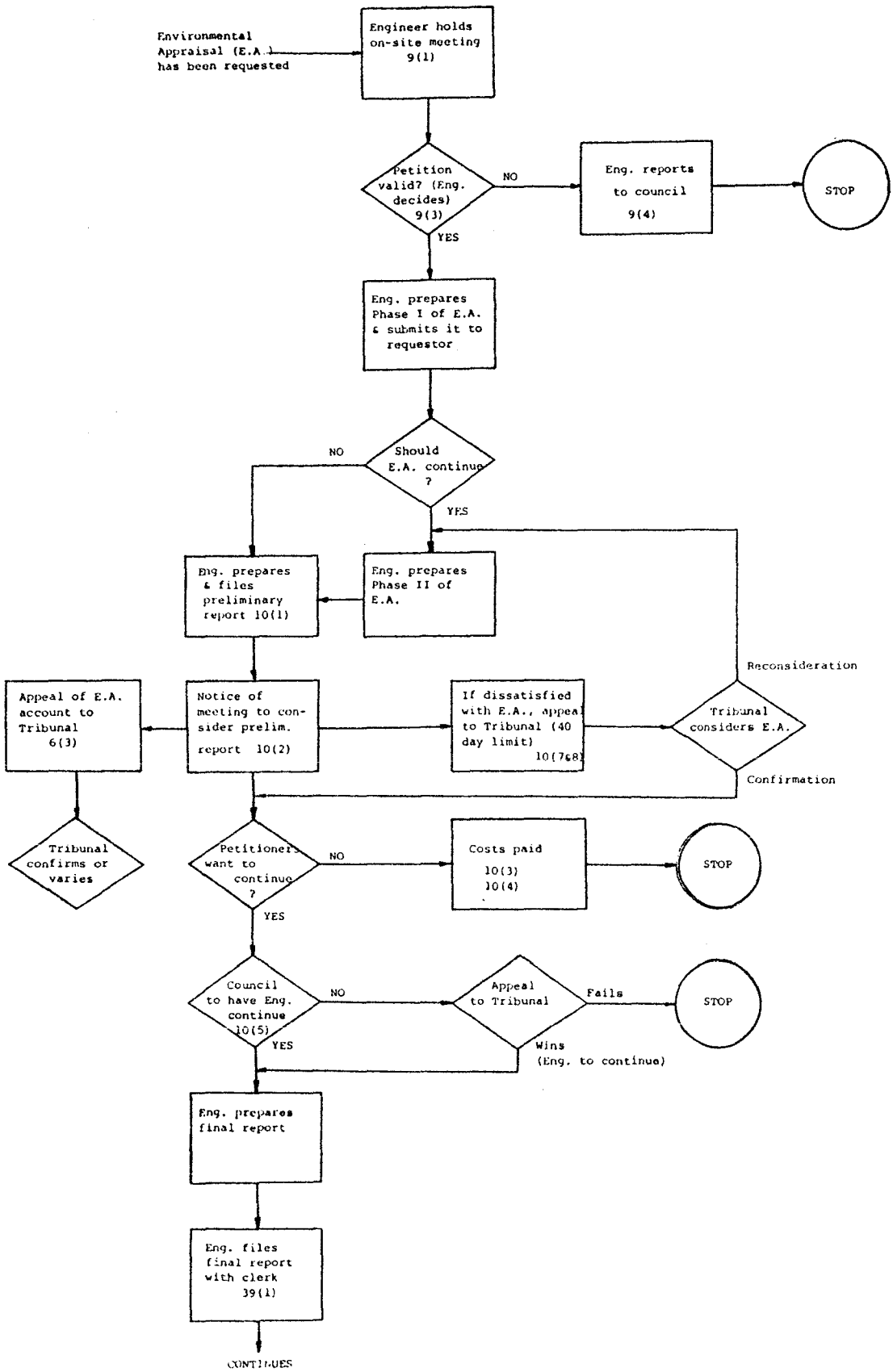
of the environmental and benefit/cost studies) are distributed amongst the original petitioners. If, however, a sufficient petition exists, the council may instruct the engineer to proceed with the preparation of his final report. This procedure is represented in the attached flow chart (see Figure 1).

The engineer has six months from time of appointment to time of filing of the final report (Section 39(1)). If necessary, Phase 1 and 2 along with the preliminary report are filed with the council, considered at an open council meeting, the engineer instructed to proceed with his final report and the final report filed, all within an approximate six-month time frame. However the time limit can be extended by a resolution of the council of the initiating municipality.

If dissatisfaction exists with the Environmental Appraisal, an appeal can be made to the Drainage Tribunal (Section 10(7)). Similarly, the Minister of Agriculture and Food or the Minister of Natural Resources may refer the appraisal to the Tribunal (Section 10(8)). This appeal must be made within forty (40) days after the meeting considering the preliminary report (Section 10(9)). The requesting party may also appeal the account (invoice) for the Environmental Appraisal to the Drainage Tribunal within 40 days after the account is received (Section 6(3)).

For the maintenance, repair and improvement of drainage works, the proceedings, as outlined above, also prevail.

DRAINAGE ACT - PETITION DRAINS - PROCEDURE



PART II: CONTENTS OF THE ENVIRONMENTAL APPRAISAL

The suggested contents of both Phase 1 and 2 are listed. These provide guidance as to the information required to identify potential environmental effects of the project, and to propose solutions for reducing adverse impacts. Any additional information found to be relevant to the decision making process, should also be included in the study. Most of the Phase 1 information can be obtained from existing documents, while Phase 2 will require more extensive study.

The Appraisal will assist the engineer in designing a drain which will provide the greatest benefits while minimizing adverse effects. To achieve this end, alternative routes for the drain need to be examined and evaluated in terms of benefits and disbenefits to the physical, biotic, social and economic environment. Only those aspects of the environment which are expected to be affected, positively or negatively, by the drain, need be examined. Each alternative needs to be evaluated until it is determined that it is not feasible, or that it does not provide the greatest overall benefits at the least total cost. There must be a clear indication of why an alternative has been discarded. At a later date it may be found that an alternative, previously discarded, should be re-examined.

A number of procedures and techniques can be applied to prevent or minimize adverse effects during construction and operation. Design variations, construction techniques, construction phasing or scheduling, maintenance practices and rehabilitation alternatives should all be considered.

The contents for both Phases are listed below. All items in Phase 1 are numbered 1.1, 1.2, etc., while Phase 2 aspects appear as 2.1, 2.2, etc. The list of contents is followed by a discussion indicating the general intention of each section, and where information may be obtained. The numbering system for the discussion section is consistent with that just described.

PHASE 1

1.1 A general statement of benefits expected to occur as a result of the drainage project.

1.2 Location of the watershed boundaries of the area to be drained, and the approximate size of the area.

1.3 Indicate possible routes of the drain and describe:
- 1.3.1 existing watercourses.
- 1.3.2 existing use of land in immediate vicinity of routes.

1.4 List soil types present within the area to be drained, indicating the relative percentage of each type. Provide a general comment on erosion potential and the possible reaction of the soil to artificial drainage.

1.5 Indicate agricultural capability of lands within the watershed of the area to be drained, especially soils classified as having excess water.

1.6 Describe the outlet receiving body, including:
- 1.6.1 general physical description.
- 1.6.2 existing water uses of receiving body.

1.7 Within the watershed of the drain, and the receiving body watershed identify:
- 1.7.1 existing activities which could be affected.
- 1.7.2 anticipated future outlet drainage projects.

1.8 Identify, in general, the existing and proposed plans for the watershed of the drain, as stated in local and Regional Official Plans and Zoning bylaws. Identify any other significant planning or development intentions.

1. 9 Identify any social or economic conditions of relevance to the drainage project.

1.10 Identify any other sensitive areas which might be affected by the drainage project.

PHASE 2

2. 1 STATEMENT OF PURPOSE OF THE DRAIN

2. 2 DESCRIPTION OF THE AREA TO BE DRAINED

- location of area
- size of area
- topography

2. 3 DESCRIPTION OF THE ENVIRONMENT

2.3.1 Physical Environment

2.3.1.1 Hydrological Characteristics

2.3.1.1.1 surface water - indicate all

existing water courses, waterbodies and wetlands within the watershed of the drain, including main outlet drains, surface ditches, streams, rivers, swamps and marshes, etc.

for all waterbodies and water courses which could be affected by the drainage activity collect the following:
- describe channel characteristics
- describe watercourse gradients
- record water quality parameters (e.g. water temperature, sediment load, BOD, DO, nutrients, pH, etc.)
- record water quantity parameters (highs, lows, velocity, flooding, etc.).

2.3.1.1.2 ground water
- describe quality
- describe quantity
- identify recharge areas, particularly those that are wetlands
- identify nearby developed sources

2.3.1.2 Soils

- identify soil types
- general statement of drainage characteristics of the soil.
- comment on erosion potential
- describe agricultural capability of soils (mineral and organic).

2.3.2 Biotic Environment

2.3.2.1 Fish and Wildlife

2.3.2.1.1 Fish - describe presence, population and suitability of habitat for fish, including spawning habitat
- identify presence of rare or unique species
- identify fish migration routes and patterns

2.3.2.1.2 Wildlife - describe presence, abundance and suitability of habitat for wildlife (ie. waterfowl, upland game, ungulates, furbearers)
- identify presence of rare or unique species
- identify wildlife migration routes and patterns

2.3.2.2 Vegetation
- describe forests woodlots, wetlands and scrub (bush) areas.
- identify presence of rare or unique species.

2.3.3 Social and Economic Environment

2.3.3.1 Agriculture

- locate areas presently in agricultural production.
- determine the proportion of the area to be drained that is presently in agricultural production.
- describe agricultural operations e.g. types of crops grown, types of livestock/poultry operations, trends in crop or livestock production, size of farm operations, etc.
- percentage of area to be drained with existing drainage (field and outlet).
- statement of existing drainage problems.

2.3.3.2 Residential, Commercial and Industrial Land Uses

- locate hamlets and communities
- describe existing and proposed plans for the area to be drained as stated in local and Regional Official Plans and Zoning Bylaws.
- identify any other significant planning or development intentions.
- identify users of water from existing watercourses (e.g. industrial, municipal, private, etc.)
- identify forestry activity in area to be drained-existing and potential.

2.3.3.3 Other Land Uses

- identify recreation uses, existing and potential for, hunting, fishing, trapping, other.
- identify public lands - institutional, Conservation Authority properties, managed forests, etc.
- identify forests and wildlife areas managed in conjunction with public agencies.
- identify transportation and communication land uses.
- identify other land uses.
- identify any abandoned or capped gas and oil wells.
- identify any aggregate or petroleum resources.

2. 4 IDENTIFY ALTERNATIVE ROUTES AND/OR DESIGNS FOR THE PROPOSED DRAIN

2. 5 IDENTIFY THE POTENTIAL EFFECTS, both major and minor, of each alternative on the physical, biotic, social and economic environment.

- cost comparisons for each alternative should be made.
- for each alternative, where possible, identify procedures and techniques for minimizing detrimental effects and maximizing benefits.

2. 6 Based on an evaluation of the above effects SELECT THE ALTERNATIVE which results in the greatest benefits and least disturbances.

PART III: DISCUSSION

The following clarifies further the guidelines for both phases of the Environmental Appraisal. Each phase is discussed separately. For each section listed in each Phase of the Appraisal there is a corresponding elaboration. After the discussion for each section a list of possible sources of information is given, however, there may be other sources in addition to those listed.

PHASE 1

Phase 1 is a screening process whereby those requesting the Environmental Appraisal can determine whether there are significant detrimental effects likely to occur as a result of construction, maintenance or operation of the outlet drain. This phase would also identify any factors which need to be examined in greater detail. Field investigation is generally not required, as most information should be available at the appropriate sources. If information is not available this should be indicated in the Environmental Appraisal document. In such instances indicate whether the missing information is thought to be necessary, and how difficult it would be to obtain. In all instances the source of information, whether it is a document or conversation, should be indicated.

All criteria listed within Phase 1 should be considered, however only a brief comment on each is necessary. A considerable amount of the information could be presented in visual form on a map. If it is felt that an item is not relevant, a statement as to why it is unimportant is required.

1. 1 Benefits Likely to Occur

A general indication is needed as to how the quantity or quality of crop yield or livestock/poultry production might change as a result

of construction of the outlet drain. Any major changes anticipated in farm management should be described such as: expansion or intensification of farm operations; improvements in scheduling or timing of farm functions; and installation of tile drainage. Other benefits may include increased forestry potential and changes in risk of local flooding.

These benefits need not be given in monetary terms and should not be confused with the benefit-cost statement as outlined in Section 7 of The Drainage Act.

Possible Source: Agricultural Representative in the local Ministry of Agriculture and Food Office.

1. 2 Location

A sketch is needed of the area to be drained indicating the boundaries of the watershed of the drain. Indicate lot and concession numbers, and local roads. This sketch will assist those requesting the Environmental Appraisal to locate the drainage project more exactly.

An approximation of the size of the area to be drained is required.

1. 3 Possible Routes

It may be possible at this stage to identify a number of routes which the drain could take. Traditionally drains have followed natural watercourses, fence lines, woodlot borders, etc. However, in many instances other routings are possible. Besides following these physical features to determine routing, other criteria could be used such as the location of woodlots and wetlands. Some routes may follow an existing watercourse, that is a defined channel, while others may require construction of a new channel. The purpose of identifying possible routes at this early stage is to enable those requesting the Environmental Appraisal to determine whether the drain might go through water or land areas for which they have a particular concern or interest. At this point it is not necessary to evaluate any alternative as to its feasibility.

1.3.1 Existing Watercourses:

If any possible route would use an existing watercourse this should be indicated. The status of the watercourse should be described, that is whether it is a natural stream, a previously constructed drain, a ditch, etc. Known names of the watercourses should be given.

1.3.2 Existing Land Use:

Information on the type of land uses in the immediate vicinity of each possible drain route is required. This can be obtained through visual examination. The area of concern is the construction zone or approximately 50 feet on either side of the route. Land uses which would be severed (cut) by the drain, such as woodlots, agricultural fields, recreation areas, etc., should be identified.

1. 4 Soil Types

Soil Survey Maps and Reports, prepared on a county basis, describe and show the location of soils in Ontario. The soil types, that is the series name and surface texture, (e.g. Huron silty clay) can be identified from these maps.

Predictions should be made of the potential for soil erosion, and the ability of artificial drainage to be effective in the area under study. These could be based on the personal experience of those familiar with the study area, and/or information on surface and sub-surface soils obtained from County Soil Survey maps and reports.

Soil erosion, in this instance, is the loosening of soil particles from the main body of soil and its transport to another location. Substantial erosion can occur during construction and subsequent operation of the drain. Increased sediment loads can significantly disturb fish and wildlife habitats downstream. Similarly, due to soil erosion a layer of soil may be deposited over a downstream area of productive soil thus affecting the crop-producing potential.

To evaluate the long term benefits of an outlet drain it is necessary to know the potential reaction of the surrounding soils

to artificial drainage of both the field and outlet type. The "Drainage Guide for Ontario" gives an indication of the potential of various soil types for sub-surface field drainage systems.

Possible Sources:

County Soil Survey Reports and maps can be ordered at $2.00 per copy from: The Information Branch, Ontario Ministry of Agriculture and Food, Legislative Buildings, Toronto, Ontario, M7A 1A5.

Soil maps which are out of print and unpublished maps of northern districts can be viewed in the local OMAF offices.

Drainage Guide for Ontario can be ordered free of charge from the Information Branch (address above).

Regarding erosion - Environmental Planners and Regional Directors in regional offices of the Ministry of Transportation and Communications.

A set of maps of the Physiography of Southern Ontario, indicating the type of sub-soil present is available for $6.50 from:

Ministry of Natural Resources
Administrative Services Branch
Public Service Centre
Whitney Block, Room 6404
Queen's Park, Toronto, Ontario

1. 5 Agricultural Capability

From viewing agricultural capability on Canadian Land Inventory (C.L.I.) maps, estimate the general proportion of each class of agricultural land. In particular note if there are any within the subclass "W" denoting excess water other than from flooding. Whenever possible use maps at a scale of 1:50,000. However, if these are not available the 1:250,000 scale can be used.

Possible Sources:

Black and white maps at a scale of 1:50,000 are available at $.50 per copy from:

Graphic Arts Service
Room 2B
Johnston Hall
University of Guelph
Guelph, Ontario

Broad coverage mapping of Soil Capability for Agriculture at a scale of 1:250,000 is available at $1.00 per copy from:

Publishing Centre
Department of Supply & Services
270 Albert Street
Ottawa, Ontario
K1A 0S9

All orders should specify the municipalities for which coverage is required.

1. 6 Outlet Receiving Body

The initial body of water (river, creek, lake, drain, etc.) into which the drain will outlet should be identified. Where possible indicate its common and gazettered name.

1.6.1 Physical Description:

A general physical description of the receiving body will assist in determining if the drain will alter the existing environment of the receiving body. Describe aspects of the receiving body such as its size, approximate width and depth, typical water flow (intermittent or continuous), flooding problems which are known to occur, vegetation of banks, etc. Where possible, information on the known maximum summer temperature should be given. This may have been measured at the flow metering stations operated by the Ontario Ministry of the Environment or Environment Canada. If information on temperature is not available indicate whether the waterbody is classed as warm or cold.

Possible Sources:

For information on water flow - the regional office of the Ministry of the Environment.

For information on stream temperature classification - the regional office of the Ministry of Natural Resources and the Resource Manager of the local Conservation Authority.

1.6.2 Existing Water Uses:

To determine what effects, if any, the drain might have on those who presently use water from the receiving body, existing users need to be identified. This includes both those taking water; such as for irrigation, industrial use, drinking water or livestock water; and those discharging effluent into the receiving body. Other activities for which the receiving body is used, such as recreation or fishing, should be identified.

Possible Sources:

Regarding industries' use of the watercourse - the Regional Manager of the Ministry of the Environment.

Regarding agricultural uses - local office of the Ministry of Agriculture and Food.

For other uses - District Manager of the Ministry of Natural Resources, and the local Conservation Authority.

1. 7 Watershed Activities

To aid in determining the possible effects of the drain on both the area to be drained, and areas immediately downstream or upstream from the drain, information on land uses within the watershed of the drain and the watershed of the receiving body is needed.

1.7.1 Existing Activities:

Within both the watershed of the drain and of the receiving body there may be activities presently undertaken which could be affected, such as foresty, agriculture, recreation, hunting, fishing, nature appreciation, flood plain uses, etc. All major land uses which could potentially be affected by either the construction or operation of the drain should be identified. For example, are there any flooding problems anticipated? A comment should be made on the expected magnitude of these effects (e.g. temporary, major, minor, direct, indirect).

Possible Sources:

Local offices of the Ministry of Natural Resources, Conservation Authority, and the Ministry of Agriculture and Food.

Municipal or township offices.

1.7.2 Other Drainage Projects:

The effect of an individual drainage project may often be relatively small. However, the effects may become magnified or accumulative if other drainage projects are undertaken in the same general area. Therefore, describe the anticipated extent of this drainage project and indicate other areas within the watershed of the receiving body which are likely to initiate the construction or maintenance of an outlet drain in the future. Indicate the likely extent of these projects.

Possible Sources:

Township or municipal offices

Agricultural Representative in local Ministry of Agriculture and Food Offices.

1. 8 Plans

If one purpose of the outlet drain is to improve agricultural production, it is important to know to what extent agricultural land uses will exist in the area in the future. This is of particular concern in areas that are experiencing considerable non-farm development. Approved official plans and plans that have been drafted but not yet officially approved, and zoning bylaws should all be reviewed to identify likely changes in land use. If any other major changes in future land use are foreseen they should be described.

Possible Sources:

Information on Official Plans and bylaws from township or municipal offices.

Information on changes in agriculture - Ministry of Agriculture and Food.

1. 9 Social or Economic Conditions

Indicate all potential social and economic effects of the construction and operation of the drainage project, that have not been considered elsewhere in the Environmental Appraisal. For example, describe unusually high costs anticipated in construction

or maintenance of the drain. What effect could the drain have on the viability of farming in the area? Would there be any economic losses as a result of drainage?

Possible Sources:

Agricultural Representatives of the Ministry of Agriculture and Food.

1. 10 Sensitive Areas

Construction and operation of this drainage project may affect areas that are significant due to the presence of wildlife, rare vegetation, historical sites, etc. All such areas and features should be identified.

Possible Sources:

Regional office of the Ministry of Natural Resources and local environmental organizations such as Field Naturalist Club.

For information on archeological sites contact the Ministry of Culture and Recreation.

The Municipality, Conservation Authority, or the Ministry of Natural Resources may have already mapped sensitive areas.

PHASE 2

The following is an amplification of each item within the second phase of the Environmental Appraisal. This phase will enable adequate consideration of the potential effects of the drainage works on the physical, biotic, social and economic environment, and will assist the engineer in the location, design and construction of the drainage works. This appraisal should influence and be an integral part of the decision-making process.

This phase of the Appraisal primarily consists of an examination of the existing environment, the development of alternative routes and designs for the drainage project and an evaluation of the effect these alternatives might have on the environment. Information on a variety of aspects of the existing environment is needed in order to predict possible negative and positive effects and to facilitate the

development of mitigation measures to reduce undesirable impacts.

Only aspects of the environment which might be affected by the drainage project need be examined. The parameters to examine should be identified at an early stage through discussion with those requesting the study. Factors not outlined in these guidelines which could be affected by the project, should also be discussed. Additional factors may emerge as the study progresses.

The geographic area studied will vary relative to the factor being examined, and the particular circumstances of the project. The area of concern is that which could potentially be affected. The study area must extend as far as the potential effects on the physical, biotic and socio-economic environment, and therefore may be larger than the area to be drained. Hence, in instances where the effect of the project extends downstream from the area to be drained, portions of the downstream environment would need to be examined. The geographic area for each factor will be defined through discussion with those requesting the Environmental Appraisal, and should be based on information received from the other Possible Sources listed under each item.

Input should be obtained from a wide variety of sources. Residents in the locality of the project should be approached to obtain their perception of potential effects. This might by done be advertising the on-site meeting in local newspapers, encouraging those within the general vicinity to attend. Local organizations could also be contacted, such as naturalist groups, angler and hunter clubs, farm organizations, etc.

Possible Sources:

Ontario Federation of Agriculture
387 Bloor Street East, Suite 502
Toronto, Ontario *(416/967-6660)*

Ontario Federation of Anglers and Hunters
36 Front Street South
Campbellford, Ontario *(705/653-3149)*

Federation of Ontario Naturalists
1262 Don Mills Road
Toronto, Ontario *(416/444-8419)*

2.1 Purpose of the Drain

A statement of why this particular drain should be constructed or maintained is required. Indicate the objectives of the petitioners in requesting this project. The purpose will be similar to the Phase 1 statement of benefits likely to occur, although in greater detail. Identify in non-monetary terms the benefits and services which this project will provide and to whom these will accrue.

Possible Sources:

The petitioners.

2.2 Description of Area

On a map (preferably at a scale of 1:50,000 or better, such as 1:25,000) locate the boundaries of the area to be drained, often referred to as the mini-drainage basin or mini-watershed. This would include all lands which would receive outlet or benefit. Also delineate those lands which could change in agricultural production, either positively or negatively, due to the drainage works. The point at which the drain will enter the receiving body of water must also be indicated. From this map, the size of the area to be drained, in hectares or acres, can be calculated.

The topography of the area may be evident from the map, if topographic lines are indicated. If these are not present, give a general description of the topography (e.g. level, gently rolling, hilly, etc.). Most soil maps also give an indication of slope topography.

Possible Sources:

For maps contact local township or municipal offices.

For Ministry of Transportation and Communication County maps (scale 1 inch: 1 mile):

The Superintendent of Record Services
Record Services Section, Map Unit
Ministry of Transportation & Communications
1201 Wilson Avenue
Downsview, Ontario, M3M 1J8

For topographic maps at various scales:

Ontario Ministry of Natural Resources
Map Unit, Public Service Centre
Whitney Block, Room 6404
Queen's Park
Toronto, Ontario, M7A 1W3 (416/965-6511)

2. 3 Description of Environment

The present physical, biotic, social and economic environment must all be described in some detail to enable predictions of the effects of the drainage works. The actual elements of the environment to be described and their geographic extent will vary for each project.

2.3.1 Physical Environment

2.3.1.1 Hydrologic Characteristics:

Within this section particular aspects of the character and distribution of water within the general area of the drain are described. This description of the hydrologic regime will enable a prediction of the likely effects of the drain on water quality and quantity.

2.3.1.1.1 Surface Water:

On a map identify all existing watercourses, waterbodies and wetlands, giving their location, common name and status. Status should include whether it is an existing drain, creek, river, beaver pond, etc. and whether the flow is continuous or intermittent.

The remaining information on quality and quantity of surface water need only be collected for those watercourses and bodies which could be affected by the drainage project. If the outlet or receiving body could be affected, it would need to be examined. Similarly, in some instances, watercourses upstream from the area to be drained could be affected and should be described. This information would provide an understanding of the watercourses, or waterbody's potential for activities such as fish and wildlife habitat, domestic, industrial and commercial uses.

A description of the channel characteristics such as the form of the watercourse, stream bank slope and vegetation, condition of the banks, and bottom characteristics should be given. Some of this information can be obtained through visual observation.

Watercourse gradient data will provide an understanding of water velocity. This may be available from previous reports. If not, the percentage slope of relevant watercourses will have to be measured.

Information on existing water quality is important to enable a prediction of effects, and following construction, to determine the changes in water quality that have occurred. The water quality parameters which need to be measured will depend on the present uses of the watercourse. Those requesting the Environmental Appraisal will have to specify which parameters are to be considered. Water temperature information should include the maximum summer temperature.

If water quality information is not available some measurements must be taken. In some instances information on water quality may be limited or minimal and difficult to obtain. In these cases collect information on the species composition of bottom vegetation and benthic organisms (e.g. those occurring at the bottom of the body of water) as these reflect water quality parameters. If this is done, indicate the time of year during which the information was collected.

To be able to anticipate changes in the water flow regime, information on peak flows, low flows, estimated time of travel, and velocity of flow is needed. Describe existing flooding hazards, their location, timing and intensity.

Possible Sources:

Local Conservation Authority, Regional Offices of the Ministry of Natural Resources, and the Ministry of the Environment.

2.3.1.1.2 Ground Water:

If the drain has a potential to affect the water table, recharge areas or wetlands, a description of the groundwater regime is required. If possible locate recharge areas on a map. Describe any developed sources of ground water.

Possible Sources:

Recharge areas may have been mapped by the Conservation Authority.

Well records of the Ministry of the Environment will give an indication of water table.

2.3.1.2 Soils:

To identify feasible routes and designs for the drain a variety of engineering and agricultural properties of the soil must be known. Soil types within the area to be drained, obtainable from County Soil Surveys, should be located on a map.

Information on the drainage characteristics of soils within the area to be drained is needed to determine the general potential for improved soil conditions for agricultural production. In particular, it will enable an estimation of potential field drainage installation. Information on the natural drainage of soils is contained in the County soil maps and reports, where soils have been categorized into drainage classes. From this classification, indicate whether each soil type is rapidly drained, well drained, moderately well drained, imperfectly drained, poorly drained or very poorly drained. The "Drainage Guide for Ontario" published by the Ministry of Agriculture and Food also provides information on the potential for tile drainage. From this source and any other available information indicate the likely response of the soil to field and outlet drainage.

As outlined in Phase 1, it is important to know the potential for soil erosion so that the effect on downstream environments can be predicted and through mitigation, alleviated. To further establish the erodibility and stability of soils along the drain

route, engineering tests may be required. Anticipated changes in soil stability and downstream shorelines and floodplains, due to erosion, should be described. The Universal Soil Loss Equation which primarily predicts rainfall erosion losses, may be applicable.

The agricultural capability of the soils should be identified to assist in the determination of possible changes in productivity. In particular, describe soils having excess water, and those likely to receive benefit from the drain.

Possible Sources:

County Soil Survey Reports and maps, can be ordered for $2.00 from the Information Branch of the Ministry of Agriculture and Food. If out of print they can be reviewed at local OMAF offices.

Drainage Guide for Ontario available free of charge from the above address.

Information on the Universal Soil Loss Equation is available from University of Guelph, Department of Land Resource Science (519/824-4120 Ext. 2455)

Agricultural Capability maps at a scale of 1:50,000 are available for $.50 per copy from the Graphic Arts Service, University of Guelph. See Phase 1.

2.3.2 Biotic Environment

An understanding of the existing aquatic and terrestrial environment is required to predict the effects of the drain. All areas which could be affected, including areas upstream and downstream from the drain, need to be described.

2.3.2.1 Fish and Wildlife:

Watercourses, woodlots and wetlands may presently provide a habitat for fish and wildlife. Changes in water quality, water quantity, and vegetation can severely disturb and damage these habitats. To predict such disturbances, if any, the characteristics of existing habitats must be known.

2.3.2.1.1 Fish:

Identify the species of fish present and estimate their population (abundance) noting any that are rare or unusual. Locate any known spawning ground indicating its size and time of year of spawning as well as migration routes.

Indicate the relevant features of the environment which contribute to the suitability of the habitat, that is the quality of the environment, for particular species of fish. If this information is not available, identify the benthic organisms, as these give an indication of the water quality and therefore the suitability of the environment for particular fish species.

Possible Sources:

Ministry of Natural Resources and Conservation Authority.

2.3.2.1.2 Wildlife:

Identify the wildlife species and comment on their abundance. Note any rare or unusual species. Locate on a map any known migration routes, any areas used as a stop-over for migratory birds, breeding or nesting grounds, and wildlife refuges or sanctuaries. Describe the suitability of the habitat.

Possible Sources:

The Resource Manager of the Conservation Authority for mapped wetlands, wildlife areas and lists of endangered and rare species.

Local environmental groups and naturalists clubs.

Ministry of Natural Resources district office.

2.3.2.1 Vegetation:

Locate forests, woodlots, wetlands and scrub areas on a map. Describe each feature in terms of its extent, quality or condition and type of vegetation (predominant species). Note any rare or endangered species of plants or trees which could be affected by the drainage project.

Possible Sources:

Ministry of Natural Resources district office.

Local environmental groups and naturalist clubs

Municipal or township offices.

Conservation Authority Resource Manager.

2.3.3 Social and Economic Environment

The above factors have described the more natural features of the environment. This following section will primarily examine those aspects which have been contributed by man, and ways in which man uses land.

2.3.3.1 Agriculture:

To develop an understanding of the effect an outlet drain could have with respect to farming, agricultural operations and facilities need to be described in some detail.

On a map of the area to be drained locate all those areas presently in agricultural production. Determine what proportion this represents of the total area to be drained. Indicate the types of operations - cash crop, livestock, poultry, orchards, market gardening, etc. Provide descriptive information on farm operations such as size of farms, full-time or part-time farmers, existing infrastructure (servicing centres), etc. Also note any trends in farming such as changes in amount of land in agricultural production, changes in farm size, and changes in types of crops grown. Describe any special agricultural programs which are presently being carried out or are planned for the area.

With respect to drainage, identify on a map, existing outlet and field drainage works and comment on their present condition and effectiveness. Describe existing drainage problems, indicating their probable cause, extent and intensity. For example, indicate whether the excess soil moisture is due to a water table near the soil surface, spring flooding, topography, or dense or impermeable subsoils. Indicate crop restrictions due to drainage problems.

Possible Sources:

Agricultural Representative at the local office of the Ontario Ministry of Agriculture and Food

2.3.3.2 Residential, Commercial and Industrial Land Uses:

As construction or maintenance of drainage works may affect a variety of land uses, it is important to be aware of what land uses currently exist. On a map, locate existing municipal boundaries for all communities and hamlets within the area to be drained. What are the planning or development intentions for the area as outlined in proposed and existing zoning bylaws and local and Regional Official Plans? Intentions can be described in general terms indicating trends in land use, or major foreseeable changes in land use. In particular note any proposals or plans which would alter the existing orientation of the area. There may be other relevant plans for this area, not outlined in official plans or zoning, which should be described. These would include plans of special commissions such as the Niagara Escarpment Commission, or watershed plans of the local Conservation Authority.

Identify individuals or agencies presently using the water from the area to be drained, either by taking or contributing to the water supply, including all domestic, agricultural, industrial, and commercial users. How construction of a drain, or alteration of the existing water regime, will affect these users will need to be determined. If water users downstream or upstream from the drain could be affected, they should be included in the discussion.

As construction of a drain may alter the water regime of the surrounding area, it may have either a beneficial or detrimental effect on the forest industry. If there is a forest industry in the area this should be noted, including its location and size of operation. Is there potential in the area for this industry to be expanded and are there intentions to do so?

Possible Sources:

Existing and proposed plans - municipal or township offices.

Regarding forestry - district office of Ministry of Natural Resources.

2.3.3.3 Other Land Uses:

The suitability of an area for recreation frequently relies on the quality of the water and vegetation aspects of the environment. If these aspects are altered, recreation may be affected. Therefore to predict effects, the types of recreation and the environment in which they occur should be described.

Locate on a map those areas which are used for recreation. This should include all those within the area to be drained as well as any recreation areas downstream or upstream from the proposed drain which could be affected by drain construction. Existing activities such as swimming, hiking, fishing, hunting, nature observation, and canoeing should be described, as well as the area's potential for such activities. Also locate on a map, Conservation Authority properties, Provincial wildlife areas managed by the Ministry of Natural Resources, agreement forests, county forests, provincial parks, institutional properties and any other publicly owned lands. In addition, locate those areas that are not publicly owned but are managed for forests or wildlife under agreements between the landowner and the Ministry of Natural Resources.

Indicate on the map existing and planned communication and transportation uses such as highways, railways, hydro lines, pipelines, etc. Identify any other relevant land uses which could be affected which have not so far been described. This would include existing and potential gravel, stone or sand pits or quarries; vacant land; mineral resources; and other uses.

Possible Sources:

Local Conservation Authority and Ministry of Natural Resources.

Ministry of Transportation and Communications, Ontario Hydro, Bell Canada, pipeline companies.

2. 4 Identify Alternative Routes

As outlined in Phase 1, Section C, it should now be possible to identify alternative methods of carrying out the undertaking to achieve the outlined purpose. These should include alternative

routings or locations, and major variations in design. Variations in design concepts might include alternatives for open or closed channels, a reservoir, pumping station, sluice gates, etc. At this stage detailed design is not required.

2. 5 Determination of Potential Effects

The alternatives which have been identified need to be evaluated to determine which will do the best job in terms of providing benefits at the least cost to the physical, biotic, social, and economic environment. Each alternative should be discussed with reference to its effect on the characteristics of the existing environment outlined in these guidelines. Consequences of construction, operation and maintenance of the project must all be considered.

This stage is a sorting or selecting procedure where the effect and benefits of each alternative should be compared with other alternatives. The advantages and disadvantages of each proposal should be clearly identified in the Environmental Appraisal document. When it is determined that a specific alternative is not going to achieve the purpose or meet the objectives, with the least environmental and social cost, that alternative can be discarded from further consideration. However, there must be a clear explanation as to why that alternative has been eliminated.

The effect of each alternative on the economic environment must be carefully considered including determination of approximate costs, and anticipated economic benefits. As the cost of maintenance of outlet drains is often quite large, future maintenance in terms of costs and frequency should also be taken into account.

It is often possible to make changes to the design of a project which will reduce or completely overcome anticipated detrimental effects. These potential mitigation procedures should be evaluated in terms of feasibility and cost, and ability to minimize adverse effects. Measures which will mitigate or eliminate detrimental effects on the drained area and receiving body, during construction, operation and maintenance, should be considered.

A variety of techniques to mitigate detrimental effects are possible. These could include:- changes to the storage of spoil to reduce sedimentation in downstream watercourses; stabilization of drain banks to reduce erosion; timing of construction to reduce impact on fish spawning; the construction of artificial spawning areas, reduction in amount of vegetation removed from the route of the drain to maintain existing fish habitat; and use of sediment Ponds.

2.6 Selection of Best Alternative

Based on the evaluation of the environmental effects and all other considerations, recommend a drain route, design and mitigation techniques. The benefits and disbenefits of this proposal need to be apparent. The Environmental Appraisal document should provide documentation of the decision-making process which resulted in the selection of the proposed alternative.

It may be found that none of the alternatives are feasible at this time, as none provide sufficient benefits to justify the economic and environmental costs. If this appears to be the case a "no go alternative" should be recommended. At a later date when circumstances have changed it may be feasible to again consider constructing a drain.

A P P E N D I X A

RESOURCE CONTACTS

ONTARIO MINISTRY OF AGRICULTURE AND FOOD
Agricultural Representatives

Listed below are the Agricultural Representatives of the Extension Branch of O.M.A.F. If particular problems arise the Ag. Rep. will indicate the appropriate specialist or branch.

nty/District	Area Code	Telephone	Name	Address
OMA	705	253-1941	A.G. Mitchell	1496 Wellington St. E., Sault Ste. Marie, P6A 2R1
NT	519	759-4190	D.N. Graham	207 Greenwich St., Brantford N3S 2X7
CE	519	881-3301	M.R. Bolton	Box 1330, Walkerton, N0G 2V0
LETON	613	828-9167	W.D. Black	26 Thorncliff Place, Nepean, K2H 6L2
HRANE N.	705	335-5828	N.R. Tarlton	Experimental Farm Kapuskasing, P5N 2X9
HRANE S.	705	273-2509	P. Sabourin	Box 608, Matheson, P0K 1N0
FERIN	519	941-3830	T.P. Sullivan	R.R. 4, Orangeville, L9W 2Z1
DAS	613	774-2313	R. Humphries	Box 488, Winchester, K0C 2K0
HAM	416	623-3348	A.O. Dalrymple	234 King St. E., Bowmanville, L1C 1P5
IN	519	631-4700	H.W. Buck	594 Talbot St., St. Thomas, N5P 1C7
SEX	519	776-7361	L.M. Weber	46 Fox St., Essex, N0R 1E0
NTENAC	613	544-1995	E.R. Jennings	Box 651, 1055 Princess St., Kingston, K7L 1H3
ENGARRY	613	525-1046	J.Y. Humphries	Box 579, Alexandria, K0C 1A0
NVILLE	613	238-7326	E.K. Pearson	Box 2004, Kemptville, K0G 1J0
EY	519	986-2040	G.W. Sweiger	181 Toronto St. S., Markdale, N0C 1H0
LDIMAND	416	772-3381	K.E. Best	Box 129, Cayuga, N0A 1E0
LTON	416	453-9766	H.J. Stanley	181 Main St., Milton, L9T 1N7
STINGS	613	395-3393	W.D. Tipper	Box 340, Stirling, K0K 3E0
RON	519	482-3428	D.S. Pullen	Box 159, Clinton, N0M 1L0
NORA	807	223-2415	E.H. Lick	Ont. Government Bldg., Box 3000, Dryden P8N 3B3
NT	519	354-2150	B. Fraser	Box 726,435 Grand Ave. W., Chatham, N7M 5L1
MBTON	519	882-0180	W.T. Abraham	Box 730, Petrolia, N0N 1R0
NARK	613	267-1063	R.C. Bradford	10 Sunset Blvd., Perth, K7H 2Y2
EDS	613	342-2124	C.A. Tanner	Box 635, Brockville, K6V 5V8
NNOX & ADD.	613	354-3371	G.M. Mills	41 Dundas St. W., Napanee, K7R 1Z5
NITOULIN	705	282-2043	H.R. Hodder	Box 328, Gore Bay, P0P 1H0
DDLESEX	519	434-6811	R.A. Forsyth	195 Dufferin Ave., London, N6A 1K7

unty/District	Area Code	Telephone	Name	Address
SKOKA & P.S.	705	789-5491	S. MacDonald	Box 130, Huntsville, POA 1KO
AGARA N.	416	562-4142	N.W. Hoag	Vineland Station, LOR 2EO
AGARA S.	416	732-7552	C.K. Clay	574 South Pelham St, Welland, L3C 3C6
PISSING	705	474-3050	A. Pommainville	222 McIntyre St.W., North Bay, P1B 2Y8
RFOLK	519	426-7120	J.R. Richards	19 Kent St. S., Simcoe, N3Y 2X7
RTHUMBERLAND	613	394-2998	D.F. Young	Box 820, Brighton, KOK 1HO
TARIO	416	852-3328	H.I. Bell	Box 309, Uxbridge, LOC 1KO
FORD	519	537-6621	C.B. Mathews	Box 666, 954 Dundas St. E. Woodstock, N4S 7Z5
EL	416	451-5474	R.E. Bell	3 Elizabeth St. S. Brampton, L6Y 1P7
RTH	519	271-0280	A.W. Scott	Box 398, 478 Huron St., Stratford, N5A 6T3
TERBOROUGH	705	745-2403	J.R. Cockburn	55 George St. N. Peterborough, K9J 3G2
ESCOTT	613	673-5115	R.L. Farmer	Box 110, Plantagenet, KOB 1LO
INCE EDWARD	613	476-3224	L.W. Matheson	Box 470, Picton, KOK 2TO
INY RIVER	807	482-2310	G. Young	Front St., Emo, POW 1EO
NFREW	613	432-4841	W.C.D. Little	315 Raglan St. S., Renfrew, K7V 1R6
SSELL	613	443-3391	A. Beauchesne	666 Rue Notre Dame, Box 540 Embrun, KOA 1WO
MCOE N.	705	322-2231	C.J. Nesbitt	Box 340, Elmvale, LOL 1PO
MCOE S.	705	435-5521	J.K. McRuer	Box 370, Alliston, LOM 1AO
ORMONT	613	933-1581	D.C. Miller	Box 655, 109-11th St. W., Cornwall, K6H 5T3
DBURY	705	566-1630	A.J. Lemay	1414 LaSalle Blvd. Sudbury, P3A 1ZO
MISKAMING	705	647-6701	J.A. Demers	Box "G", New Liskeard, PoJ 1PO
UNDER BAY	807	475-1631	W.R. Broadworth	Ont. Government Bldg., 435 James St. S., Thunder Bay
CTORIA	705	324-6125	C.L. Hamilton	322 Kent St. W. Lindsay, K9V 2Z9
TERLOO	519	744-5294	G.H. Thompson	824 King St. W., Kitchener, N2G 1G1
LLINGTON	519	843-2231	M.T. Chamberlain	Box 159, Fergus, N1M 2W7
NTWORTH	416	527-2995	W.D. Keys	R.R. 1, Ancaster, L9G 3K9
RK	416	895-4519	A.A. Wall	Newmarket Plaza, Newmarket, L3Y 2N1

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(Environmental Planner - Ms. M. Murray, Telephone (519) 681-1441)

CONSERVATION AUTHORITIES

Conservation Authorities are concerned with the management of water, soil, forest and wildlife resources within its watershed.

AUSABLE-BAYFIELD

Box 459, 175 Thames Rd. W.,
EXETER, Ontario NOM 1SO

Telephone (519) 235-261

CATARAQUI REGION

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MEADOWVALE, Ontario LOJ 1KO

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CROWE VALLEY

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GRAND RIVER

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HALTON REGION

310 Main St.,
MILTON, Ontario L9T 1P4

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HAMILTON REGION

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ANCASTER, Ontario L9G 3L3

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KETTLE CREEK

360 Talbot St.,
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LAKEHEAD REGION

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LOWER TRENT REGION

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MATTAGAMI REGION

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TIMMINS, Ontario P4N 1E3

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METROPOLITAN TORONTO AND REGION (M.T.R.C.A.)

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DOWNSVIEW, Ontario M3N 1S4

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MISSISSIPPI VALLEY

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MOIRA RIVER

Box 68, Municipal Bldg.,
CANNIFTON, Ontario KOK 1KO

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NAPANEE REGION

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NAPANEE, Ontario K7R 3M3

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NIAGARA PENINSULA

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NICKEL DISTRICT

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NORTH GREY REGION

330 Tenth St. W.,
OWEN SOUND, Ontario N4K 3R5

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NOTTAWASAGA VALLEY

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ANGUS, Ontario LOM 1BO

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OTONABEE REGION

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PRINCE EDWARD REGION

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RAISIN REGION

Box 10,
MARTINTOWN, Ontario

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RIDEAU VALLEY

Box 599, Mill St.,
MANOTICK, Ontario KOA 2NO

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SAUBLE VALLEY

330 Tenth St. W.,
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SAUGEEN VALLEY

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SOUTH LAKE SIMCOE (S.L.S.)

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NEWMARKET, Ontario L3Y 4X1

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SOUTH NATION RIVER

BERWICK, Ontario K0C 1G0

Telephone (613) 984-2400

ST. CLAIR REGION

205 Front St. E.,
STRATHROY, Ontario N7G 1Y8

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MINISTRY OF THE ENVIRONMENT

Regional Offices

CENTRAL REGION

The Regional Director
Suite 700
150 Ferrand Dr.
Don Mills, Ontario
M3C 3C3 Telephone (416) 424-3000

SOUTHEASTERN REGION

The Regional Director
133 Dalton St.
P. O. BOX 820
Kingston, Ontario
K7L 4X6 Telephone (613) 549-4000

SOUTHWESTERN REGION

The Regional Director
985 Adelaide St. S.
London, Ontario
N6E 1V3 Telephone (519) 681-3600

WEST-CENTRAL REGION

The Regional Director
140 Centennial Parkway North
Stoney Creek, Ontario
L8E 3H2 Telephone (416) 561-7410

NORTHEASTERN REGION

The Regional Director
469 Bouchard St.
Regency Mall
Sudbury, Ontario
P3E 2K8 Telephone (705) 522-8282

NORTHWESTERN REGION

The Regional Director
P. O. BOX 5000
435 James St. S.
Thunder Bay, Ontario
P7E 6E3 Telephone (807) 475-1205

APPENDIX B

GOVERNMENT PUBLICATIONS

MINISTRY OF AGRICULTURE AND FOOD

Publication No.	Name	Price (if any)
51	Origin, Classification and Use of Ontario Soils (1967-60 pages)	$0.50
492	Ontario Soils (1975-56 pages)	1.00
501	Farm Drainage (1975-24 pages)	-
29	Drainage Guide for Ontario (1976-24 pages)	-
-	Drainage Law (1976-folder)	-
70-042	Drainage Benefits	-
76-045	Understanding Drainage Assessment	-
74-058	Common Law Aspects of Water	-
76-092	Drainage Materials - Pipe	-
20	Agricultural Statistics for Ontario	-

also

SOILS SURVEY MAPS AND REPORT OF ONTARIO

(prepared on a county basis, these describe and show the location of various soils in Ontario)

30	Soil Association of Southern Ontario	$1.00
31	Parry Sound	1.00
32	Wentworth	1.00
37	Renfrew	1.00
38	Dufferin	1.00
43	Halton	1.00
10	Prince Edward	2.00
12	Grenville	2.00
14	Dundas	2.00
20	Stormont	2.00
25	Victoria	2.00

Publication No.	Name	Price (if any)
26	Manitoulin	$2.00
27	Hastings	2.00
28	Oxford	2.00
29	Simcoe	2.00
30	Soil Association of Southern Ontario	2.00
31	Parry Sound	2.00
32	Wentworth	2.00
33	Russell and Prescott	2.00
34	Lincoln	2.00
35	Wellington	2.00
36	Lennox and Addington	2.00
37	Renfrew	2.00
38	Dufferin	2.00
39	Frontenac	2.00
40	Lanark	2.00
41	Leeds	2.00
42	Northumberland	2.00
43	Halton	2.00
44	Waterloo - Detailed Soil Survey Report & Map	4.00

The above are availabe from:

The Information Branch
Ontario Ministry of Agriculture & Food
Legislative Buildings
Toronto, Ontario
M7A 1A5 Telephone (416) 965-1056

or from your local office of the Ministry. Make your cheque or money order payable to the Treasurer of Ontario.

MINISTRY OF NATURAL RESOURCES

Publication	Description	Price (if any)
Publications	Semi-annual list	-
Who we are - What we are doing for you	Map folder showing Ontario Townships and Natural Resources districts. District Addresses and telephones. How to get information on resources	-
Woodlot Improvement	Helpful hints for landowners 16 pages, illustrations	-
The Farm Woodlot	Management, improvement, protection, harvesting, measuring and marketing 54 pages, illustrations	$0.50
The Farm Windbreak	Location, design, species selection, planting, maintenance. 16 pages, illus.	-
Vegetation for the Rehabilitation of Pits and Quarries	Illustrated manual to assist in rehabilitation work. 38 pages	-
The Forest Trees of Ontario	Key to identification, Details on 90 native trees and 45 imported species. 120 pages, illustrations	.50
Hardwood Trees of Ontario	Bark characteristics. Photographic record with details on range, size and appearance. 60 pages, illus.	.50
The Forest Resources of Ontario	Forest areas, tree sizes, wood volumes and allowable cut, detailed by regions and species. 108 pages	.75
Wildlife Management Areas in Ontario		-
Out of the Water	Report on Ontario's freshwater fish industry. Details on fish species	-
Fishes of Ontario	Range, food, habitat, life history, identification, ways of taking and management of fish species and families 26 colour plates. 302 pages	2.50

Publication	Description	Price (if any)
Fish Ontario	See at a glance detail on presence or absence of 11 fish species in 4,582 Ontario waters located by township, county or district and degrees and minutes of latitude and longitude	$1.00
Better Streams for More Trout	How to recover the trout habitat that Ontario Streams have lost through neglect and destruction. 16 pages illustrations	.50
The White-tailed Deer in Ontario	Illustrated report on deer life history, habits, habitat,numbers, management and social and economic importance	.50
The Beaver in Ontario	Illustrated report on beaver life history, habits, habitat, numbers, management and economic importance	.50 .50
The Ruffled Grouse in Ontario	Illustrated summary of many interesting aspects of grouse habits - where and when to see grouse	.50
Rocks and Minerals Information	Sources of geological and earth science maps and publications	-
Wildlife Land Management	Details on habitat management	-
Public Service Centre Price List	Maps publications and aerial photos	-

The above are available from:

Public Service Centre
Ministry of Natural Resources
Room 6404
Whitney Block
Parliament Buildings
Toronto, Ontario

and

Ontario Government Book Store
880 Bay St. (At Grosvenor)
Toronto, Ontario

Publications may also be obtained or ordered at the Ministry of Natural Resources Field Offices. Priced items ordered must be accompanied by a cheque or money order made payable to the Treasurer of Ontario.

MINISTRY OF THE ENVIRONMENT

Publication No.	Publication	Price
G1	Publications Catalogue	-
R1	Central Region	-
R2	West Central Region	-
R3	Southeastern Region	-
R4	Southwestern Region	-
R5	Northeastern Region	-
R6	Northwestern Region	-

The above are available from:

Publications Centre
Ministry of Government Services
3B-7 Macdonald Block
Queen's Park
Toronto, Ontario
M7A 2NO

or

Ministry of the Environment
Information Services Branch
135 St. Clair Ave. West
Toronto, Ontario Telephone (519) 965-7117